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⑭発明の名称　粘着性材料押出装置におけるたれ防止装置

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明　細　書

1.発明の名称

粘着性材料押出装置におけるたれ防止装置

2.特許請求の範囲

(1)　押出装置本体にピストン杆をその軸方向に摺動自在に支承し、該ピストン杆をその軸方向の一方向に押進せしめることにより前記押出装置本体上に支持せしめた収容シリンダ内の粘着性材料を前記ピストン杆の先端に配設したピストンにより押圧して、前記収容シリンダの前端に形成したノズルより前記粘着性材料を押し出すべくした粘着性材料押出装置において、

前記ピストン杆の外径より僅かに大なる直径を有する係止孔を形成し該係止孔を前記ピストン杆に挿通して該ピストン杆の軸方向に摺動自在に、かつ前記押出装置本体に浮動的に支承された板状材よりなる係止片と、該係止片と前記押出装置本体との間に介装され前記係止片を前記ピストン杆の軸に関して鋭角に傾斜せしめるように弾発するばね部材とよりなり、該ばね部材の弾力により前記係止片の係止孔の周縁部を前記ピストン杆の外周面に摩擦的に係合せしめ、該ピストン杆の停止時および前記押進方向と反対方向への該ピストン杆の移動時に該ピストン杆と前記係止片との摩擦的係合を維持するピストン杆制動手段と、前記係止片を前記押出装置本体に対し前記ピストン杆の軸方向に該ピストン杆とともに予め定めた距離だけ移動することを許容する圧力緩和手段とからなることを特徴とする粘着性材料押出装置におけるたれ防止装置。

(2)　前記係止片は、前記係止孔からみて一方の端部を前記係止片と押出装置本体との間に介装された前記ばね部材により前記ピストン杆の押進方向と反対方向に弾発され、前記係止孔からみて他方の端部を前記押出装置本体から前記ピストン杆の軸方向にほぼ平行に突出形成された板状材よりなる支板に形成された支承孔に挿入され、該支承孔は前記ピストン杆の軸方向において対向する該孔の両端縁間の距離だけ前記係止片の移動を許容することを特徴とする特許請求の範囲第1項に記

載の粘着性材料押出装置におけるたれ防止装置。

(3) 前記係止片は、前記係止孔からみて一方の端部を、前記押出装置本体に前記ピストン杆の軸方向に程程平行に揺動自在に支承せしめた杆状部材の一端に傾動自在に止着するとともに、前記ばね部材を前記杆状部材の他端と前記押出装置本体との間に介装して前記ピストン杆の軸方向に揺動自在とされ、かつ該係止片の前記一方の端部と前記係止孔との間において前記押出装置本体より前記ピストン杆の軸方向に程程平行に突出形成した支板に支承されて傾動自在とされていることを特徴とする特許請求の範囲第1項に記載の粘着性材料押出装置におけるたれ防止装置。

(4) 前記係止片は、前記係止孔からみて一方の端部を、前記押出装置本体に前記ピストン杆の軸方向にほぼ平行に揺動自在に支承せしめた杆状部材の一端に傾動自在に止着するとともに、前記ばね部材を前記杆状部材の他端と前記押出装置本体との間に介装して前記ピストン杆の軸方向に揺動自在とされ、かつ該係止片と前記押出装置本体との間には前記ピストン杆の外周に緩く巻回された第2のばね部材により前記ピストン杆の押進方向と反対方向に弾発されていることを特徴とする特許請求の範囲第1項に記載の粘着性材料押出装置におけるたれ防止装置。

3.発明の詳細な説明

(イ)発明の属する技術分野

本発明は、粘着性の大なる材料、例えば接着剤、填隙材、接着兼填隙材、グリース等を収容シリンダから押し出して対象物に施す押出装置に関する。

(ロ)従来の技術

粘着性の大なる液状材料を収容シリンダから押し出す装置として、従来、コーキングガンあるいはグリースガンが知られている。例えば、建築物あるいはコンテナ等の躯材、パネル等の隙間や接合部に粘着性の大なる液状の填隙材あるいは接着兼填隙材を収容シリンダから押し出して充填する場合に用いられるコーキングガンは、実公昭46-31013号公報および実公昭55-11964号公報に示されているように、押出装置本体と一体に形成された収容シリンダあるいは押出装置本体に装着したカートリッジ形式の収容シリンダに粘着性の填隙材を収容し、押出装置本体にその軸方向に摺動自在に支承したピストン杆をその軸方向の一方向に押進せしめることにより、該ピストン杆の先端に配設したピストンで収容シリンダ内の填隙材を収容シリンダの前端に形成したノズルから押し出すように構成される。前記ピストン杆を押進せしめる手段としては、通常、ピストン杆の外径より僅かに大なる直径を有する係合孔を形成した板状材よりなる駆動片を前記係合孔をピストン杆に挿通して該ピストン杆の軸方向に摺動自在にかつ浮動的に支承し、押出装置本体と前記駆動片との間に介装されかつピストン杆の外周に沿わせたコイルスプリングによって前記駆動片をピストン杆の押進方向と反対方向に弾発せしめるとともに、前記押出装置本体に枢支したレバーを回動せしめることにより前記駆動片の一端をピストン杆の押進方向に押すように構成された駆動装置を具備せしめる。この駆動装置は操作者がレバーを一方向に回動せしめて前記駆動片の一端を押すことにより該駆動片をピストン杆に対して傾斜させ、係合孔の周縁をピストン杆の外周に摩擦的に係合させ、ピストン杆を前記コイルスプリングの弾力に抗する方向に駆動片とともに押進するものである。また上記押出装置には、一般にピストン杆の制動手段が具備されている。この制動手段は、通常ピストン杆の外径より若干大なる直径を有する係止孔を形成した係止片を、前記係止孔をピストン杆に挿通するとともに、その一端を押出装置本体から突出形成せしめた板状材よりなる支板に回動自在に支持せしめ、前記押出装置本体と係止片との間に介装されかつピストン杆の外周に沿わせたコイルスプリングにより前記係止片に前記ピストン杆の押進方向と反対方向に向う弾力を弾発せしめたものであつて、前記コイルスプリングの弾力により係止片は前記支板による支持点を中心としてピストン杆の軸に対して傾斜せしめられ、その係止孔の周縁がピストン杆の外周に摩擦的に係合し、ピストン杆が前記駆動装置により押進される際に

は前記コイルスプリングを撓めてピストン杆の移動を許容するが、ピストン杆の前記押進方向とは反対の軸方向移動は前記摩擦的係合によって阻止する。従って操作者がレバーを回動するとピストン杆は押進されて填隙材を収容シリンダの前端のノズルより押し出し、レバーの回動を止めると、レバーは駆動片を弾発するコイルスプリングの弾力により駆動片とともに原位置に復帰するが、ピストン杆は前記制動手段の係止片との摩擦的係合によりその前進位置に係止される。

(ハ)発明が解決しようとする問題点

上記押出装置においては、ピストン杆の押進を一旦停止せしめると、制動手段によりピストン杆はその停止位置に係止される。例えば一対のパネル間の隙間の充隙作業を終了し駆動手段の作動を停止せしめると、ピストン杆はその停止位置に止まるから、次のパネルとの間の隙間の充填作業に移動して駆動手段を作動せしめると、収容シリンダ内の填隙材は直ちに収容シリンダのノズルより押し出される。

しかしながら上述した一箇所での充填作業を終了して駆動手段の作動を停止させ次の作業箇所に移動する場合等、収容シリンダより填隙材の押し出しを一旦停止させた場合に、駆動手段を停止せしめたにも拘らず収容シリンダ内の填隙材が収容シリンダのノズルより緩い速度で押し出される現象、いわゆる填隙材のたれ現象がしばしば発生する。この填隙材のたれ現象は填隙材が粘稠度が高いほど顕著に発生する。そして上記填隙材たれ現象は、填隙材の施工をヘラ押えまたはテープによるマスキング等のために中断した場合には施工対象を汚損し、施工の作業場所を移動する場合には施工対象に無関係の床面や他の機器を汚損するほか、操作者の身体、衣服を汚損し、かつ填隙材の損失となる。さらに填隙材が有機溶剤を含有する場合には操作者の労働衛生上に好ましくない影響を生じ、かつ引火性のため火災の発生等の労働安全上にも好ましくない影響を生ずる。

(ニ)問題点を解決するための手段

本発明は前記粘着性材料押出装置における粘着性材料のたれ現象を防止しようとするものである。

本発明者らの研究によれば、前記填隙材のような粘着性材料のたれ現象は、駆動手段により押出装置のピストン杆を押進せしめると収容シリンダ内の粘着性材料を加圧してこれを押し出すが、駆動手段の作動を停止せしめると制動手段がピストン杆をその停止位置に係止するため、収容シリンダ内の圧力と粘着性材料の粘弾性のために発生するものであり、これをさらに検討すると、収容シリンダへの粘着性材料の充填時に粘着性材料の粘稠性により空気が収容シリンダの内部特にピストンの近傍に存在し、ピストン杆の押進時に収容シリンダ内の空気が加圧され、ピストン杆の停止後加圧された空気の膨脹と粘着性材料の粘稠性のため、ノズルより粘着性材料をゆっくり押し出すに至るものであることを見出した。さらに押出装置本体に収容シリンダを一体に形成したものにあっては、該収容シリンダ内の粘着性材料を施工のために費消した場合は再びノズルまたはシリンダ前端部より新たな粘着性材料を吸入または充填するため、収容シリンダ内に空気が残存するのは止むを得ないことであり、また押出装置本体に粘着性材料を充填したカートリッジ形式の収容シリンダを支持せしめる押出装置においても、収容シリンダ内に粘着性材料を充填する際に粘着性材料の粘稠性のため粘着性材料がひも状となって供給されるため収容シリンダのピストンの周縁部および周壁部に空気が若干量残留すること、カートリッジ形式の収容シリンダの使用前に収容シリンダ内の残留空気を抜くことは粘着性材料の粘稠性のために不可能であること、さらにはカートリッジ形式の収容シリンダに粘着性材料を充填する際に収容シリンダ内に空気を残留せしめないように充填するには著るしく時間がかかり、そのため粘着性材料の硬化をもたらすことから、カートリッジ形式の収容シリンダにおいても収容シリンダ内に残留する空気を皆無とすることが不可能であることがわかった。

そこで本発明は、粘着性材料押出装置における収容シリンダ内に不可避的に存在する空気による

粘着性材料の粘弾性を逆に利用し、ピストン杆の押進を停止せしめた後収容シリンダ内において圧縮された空気の膨脹によって生ずる力をピストン杆に伝達せしめ、該ピストン杆を前記ピストン杆の押進方向とは反対方向の軸方向に予め定めた距離移動せしめることにより、前記空気の膨脹力を吸収し、収容シリンダのノズルよりの粘着性材料のたれを防止しようとするものである。

(ロ)作用

本発明によれば、粘着性材料の押出時には、ピストン杆をその軸方向の一方に押進せしめることにより、収容シリンダ内に充填した粘着性材料を収容シリンダの前端に形成したノズルより押し出すものであって、この際ピストン杆制動手段の係止片は押出装置本体に対しピストン杆とともに予め定めた距離だけ移動し得るから、該係止片の係止孔の周縁部とピストン杆の外周面との摩擦的係合によりピストン杆とともに移動し、さらにピストン杆が予め定めた距離を超えて押進せしめられるときは、係止片のピストン杆の軸方向に関する傾斜を変更させてピストン杆との摩擦係合力は弱め、ピストン杆の前記軸方向の一方への押進移動を阻げることはない。ピストン杆の押進を停止して粘着性材料の押し出しを停止せしめたときは、前記押出装置本体に対するピストン杆の相対位置における停止位置において、ピストン杆制動手段はばね部材の弾力により係止片をピストン杆の軸に関して再び鋭角に傾斜せしめて係止片をピストン杆に摩擦的に係合させるが、収容シリンダ内の圧縮された空気の膨脹力がピストン杆に前記押進方向と反対方向に作用したときは、ピストン杆は係止片とともに予め定めた距離だけ前記押進方向と反対方向に移動して前記空気の膨脹力を吸収する。ピストン杆の押進が再開されれば直ちに粘着性材料の押し出しが再開される。

(ハ)実施例

第1図ないし第3図は本発明の代表的な一実施例を示す。本実施例は、押出装置本体1の支承部2にカートリッジ型式の収容シリンダ3を支持せしめた態様の実施例である。前記押出装置本体1は前記支承部2のほかに駆動手段4を配設した駆動部5とピストン杆制動手段6を配設した制動部を具備する。前記支承部2は前記駆動部5との連接部に浅い有底円筒状に金属板をプレス成形した基部21と、U字状切欠部22を形成し周縁に筒状縁を形成した金属板よりなる頭部23とを半円筒壁状に成形した金属板よりなる底板24の両端に溶接連結してなるもので、有底円筒状に形成され前端の端壁部に円錐受状に形成された合成樹脂製のノズル31を固着し、内部にピストン32を嵌装し、粘着性材料33を充填した筒状主体34からなるカートリッジ形式の収容シリンダ3を前記底板24上に支承し、ノズル31を頭部23のU字状切欠部22内に臨ませて支持するようにしたものである。なお収容シリンダ3には予め工場で粘着性材料33が充填されており、使用時にはノズル31の先端を切断してノズル孔を形成させ、かつ該ノズル3の底部に張架したアルミ箔等のシール35を破って使用に供される。

前記支承部2の基部21には、その中心に形成した孔25にピストン杆8が前記底板24の中心軸に平行に摺動自在に挿通され、その一端には金属板より皿状に成形されたピストン押圧部材81がピストン杆8の先端部に形成された螺子部82と該螺子部に螺合するナット83により固定されている。ピストン杆8の他端部は折曲された把手部84に形成されている。

駆動部5は端縁に取付縁51を折曲せしめて形成し、基体部52をU字形断面に形成した金属板のプレス成形体であって、前記取付縁51により前記支承部2の基部21の底板に溶接により固着され、前記基体部52に接続してU字形断面に形成された把持部53を一体に形成している。前記駆動部5の基体部52の内側には、ピストン杆8の外径より若干大きい直径を有する係合孔41を穿設形成した厚手の板状材よりなる矩形状の駆動片42が、前記係合孔41をピストン杆8に挿通して該ピストン杆8の軸方向に摺動自在に、かつ該ピストン杆8に浮動状態に支承せしめられており、前記駆動片42と支承部2の基部21との間

にピストン杆８の外周に沿って配設されたコイルスプリング４３によって前記基板２１から遠去かる方向に弾発されている。一方駆動部５の基体部５２と把持部５３との接続部付近に設けられた軸５４により、金属板をU字形断面にプレス成形したレバー44がその上端部付近で回動自在に枢支され、該レバー４４の上端に止着せしめた円筒軸４５を前記駆動片４２の下端部に当接せしめ、レバー４４を前記把持部５３に近接する方向に回動せしめるとき、前記円筒軸４５がコイルスプリング４３の弾力に抗して駆動片４２を押進せしめるように構成されている。前記駆動片４２はその下端をレバー４４に設けた円筒軸４５で押されると、第１図中に二点鎖線で示したようにピストン杆８の軸に関して鋭角に傾斜し、その係合孔４１の周縁部がピストン杆８の外周面と摩擦的に係合し、ピストン杆８と一体にコイルスプリング４３の弾力に抗する方向に押進され、ピストン杆８を押進する駆動手段４を構成する。ピストン杆８は駆動部５の基体部５２に穿設された孔５５に移動自在に挿通されている。

ピストン杆制動手段６は、ピストン杆８の外径より若干大なる直径を有する係止孔６１を長手方向の姓度中央部に穿設形成した板状材よりなる係止片６２を、前記係止孔６１をピストン杆８に挿通し、その上端部を駆動部５の基体部５２よりピストン杆８の軸に姓度平行に突出形成せしめた板状材よりなる支板６３に形成した支承孔６４に挿入し、その下端を前記基体部５２との間に配設した螺旋状のばね部材６５によって前記駆動片４２によるピストン杆８の押進方向と反対方向に向けて弾発せしめられている。前記支承孔６４はピストン杆８の軸方向に沿って予め定めた距離を隔てて対向する端縁６６，６７を有する。ピストン杆８が停止した状態においては係止片６２はばね部材６５の弾力により前記ピストン杆８の押進方向と反対方向にある支承孔６４の端縁６６に当接せしめられ、かつピストン杆８の軸に関して鋭角に傾斜せしめられて係止孔６１の周縁部がピストン杆８の外周面に摩擦的に係合せしめられ、ピストン杆８の前記押進方向と反対方向の軸方向移動を阻止する。ピストン杆８が軸方向の一方向に押進せしめられると係止片６２はピストン杆８との摩擦的係合を保ちながらピストン杆８とともに移動し、その上端が支承孔６４の他方の端縁６７に当接するとピストン杆８の移動に伴ってばね部材６５をさらに圧縮し、該ピストン杆８に対する傾斜を変更するとともに係止孔５１とピストン杆８との間の摩擦的係合も弱めるから、係止片６２はその位置に止まりピストン杆８の軸方向移動を許容する。駆動片４２によるピストン杆８の移動が停止すると、ばね部材６５による係止片６２の傾斜は大となって再び係止片６２とピストン杆８は摩擦的に係合し、その後ピストン杆８は係止片６２とともに該係止片６２の上端が支承孔６４の前記一方の端縁６６に当接するまで押進方向と反対方向に軸方向に移動可能となる。

本実施例によれば、押出装置本体１を把持部53とレバー４４とで把持してレバー４４を回動せしめると、ピストン杆８は駆動片４２によりその軸方向の一方に押進せしめられ、その前端のピストン押圧部材８１により収容シリンダ３のピストン３２を押圧して粘着性材料３３をノズル３１より押し出す。この間係止片６２は上述のようにその上端が支承孔６４の端縁６７に当接しかつばね部材６５を圧縮する位置に止まっている。レバー44を放してピストン杆８の押進を停止すると、係止片６２はその位置においてピストン杆８と摩擦的に係合し、同時に駆動手段４の駆動片４２にはこれをピストン杆８に関して鋭角に傾斜せしめる力が消失するので、該駆動片４２とピストン杆８との間の摩擦的係合も消失し、駆動片４２とレバー４４とはピストン杆８を停止位置に存置したまま原位置に復帰する。このとき収容シリンダ３内に存在しピストン杆８の押進行程において圧縮せしめられた空気が膨張しようとする力がピストン杆８に作用すると、ピストン杆８は係止片６２との摩擦的係合を維持したまま、係止片６２の上端が支承孔６４の端縁６７に当接している位置より一方の端縁６６に当接する位置まで、軸方向に、かつ前記ピストン杆８の駆動片４２による押進方向

と反対方向に移動し、この移動により収容シリンダ３内に存在する圧縮された空気の膨脹力を吸収し、粘着性材料３３がノズル３１よりたれる現象を防止する。従って前記支承孔６４の端縁６６，６７の距離を駆動片４２のストローク距離に基いて圧縮された空気の膨脹力を吸収するに足る距離に予め定めておくことにより、粘着性材料のたれを生じない押出装置を提供することができる。

第４図は前記実施例の変形例を示すものであって、前記実施例と対比すると、次の２点の設計変更が行われている。その第１の設計変更は、収容シリンダ３を押出装置本体１と一体に形成した点である。即ち収容シリンダ３を、ノズル３６を具えた板状材の成形品よりなる有底円筒状の頭部37を円筒状の筒状主体３８に螺装して構成し、前記筒状主体３８の端部を駆動部５に形成した円筒状の取付縁５９に溶着したものとするとともに、ピストン杆８の先端部には前記筒状主体３８の内周面に嵌合するピストン３９を固着したものである。またその第２の設計変更は、駆動手段を電気的駆動手段７に変更した点である。即ち駆動部５の軸５４にはＬ字形に成形した板状材よりなるレバー７１をその折曲部において回動自在に枢支せしめ、該レバー７１の一方の脚７２の先端には前記円筒軸４５と同一の円筒軸７３を止着し、他方の脚74には長孔７５を穿設するとともに、駆動部５の把持部５３に電磁ソレノイド７６を配設し、該電磁ソレノイド７６の作動杆７７の端部を前記脚７４の長孔７５に滑動自在に係合せしめ、把持部５３に取付けた常開スイッチ７８を閉じることによって電源（図示せず）より電線７９を介して電磁ソレノイドを付勢し、作動杆７７をその軸方向に移動させることによりレバー７１を回動させるものである。その他前記実施例と同一の符号を付した部分は同一部分を示すものとし、その説明は省略する。

この変形例においては、収容シリンダ３を押出装置本体１と一体に構成したことにより、使用時にはノズル３６を輸送用または貯蔵用の容器中の粘着性材料中に挿入し、ピストン杆制動手段６の係止片６２をばね部材６５を圧縮するように押圧してピストン杆８との摩擦的係合を解除し、その状態でピストン杆８の端部の把手部８４を把持してピストン杆８を後退せしめることにより筒状主体３８内に粘着性材料３３を吸入するか、あるいは頭部３７を筒状主体３８より取り外して前記容器から粘着性材料３３を筒状主体３８内に充填し、頭部３７を筒状主体３８に螺装して使用する。

電気的駆動手段７は、常開スイッチ７８を指で押圧する都度レバー７１が回動し、その円筒軸73で駆動片４２を押進せしめて粘着性材料３３を押し出す。その作用効果は前記実施例と同一であるから、ここでは説明を省略する。

なお、前記第１および第２の設計変更は第４図に示すように同時に施すことができる他か、第１図ないし第３図に示す実施例に第１の設計変更のみを施してもよく、また第２の設計変更のみを施してもよい。

第５図は本発明の第２の実施例を示す。本実施例は前記第１図に示すものと同様に、押出装置本体１の支承部２にカートリッジ型式の収容シリンダ３を支持せしめたものであり、その駆動手段４を配設した駆動部５の構成も第１図ないし第３図に示すものと同一である。従って第５図中第１図ないし第３図と同一符号を付した部分は同一部分を示すものとし、その説明を省略する。

本実施例は、ピストン杆制動手段１０６の構成が前記第１の実施例と異る。即ちピストン杆制動手段１０６は、ピストン杆８の外径より若干大なる直径を有する係止孔１６１を長手方向の任意中央部に穿設形成した板状材よりなる係止片１６２を、前記係止孔１６１をピストン杆８に挿通し、その上端部に形成した通孔１６３と駆動部５の基体部５２に形成した通孔５６にピストン杆８の軸に任意平行となるように牽引杆１６４の一端に螺装したナット１６６によって係止された止片167と基体部５２との間に前記牽引杆１６４の外周に沿って螺旋状のばね部材１６５を配設するとともに、前部牽引杆１６４の他端部に形成した係止頭部１６８によりばね部材１６５の弾力を係止片

１６２に弾発せしめ、かつ前記係止孔１６１と通孔１６３との中間位置において係止片１６２に当接する板状材よりなる支板１６９をピストン杆８にほぼ平行に位在するように基体部５２に容着せしめ、係止片１６２は支板１６９の先端部を支点としてその上端が牽引杆１６４を介してばね部材１６５の弾力で牽引されてピストン杆８の軸に関して鋭角に傾斜せしめられ、係止孔１６１の周縁部がピストン杆８の外周面と摩擦的に係合するように構成されているものである。

本実施例においては、駆動手段４によるピストン杆８の押進が行われてピストン杆８がその軸方向の一方に押進せしめられるときは、係止片162はその係合孔１６１とピストン杆８との摩擦により支板１６９の先端を支点として回動して傾斜度を変更しピストン杆８との摩擦的係合を弱めるから、係合片１６２は上記変更された傾斜度のままピストン杆８の押進を許容し、ピストン杆８が停止したときばね部材１６５の弾力により再び摩擦的係合を強める。そして収容シリンダ３内の圧縮された空気の膨脹力がピストン杆８にその押進方向と反対方向に作用するときは、係止片１６２はピストン杆８に摩擦的に係合した状態で前記押進方向と反対方向にピストン杆８とともにばね部材１６５を圧縮しつつ移動して、前記圧縮された空気の膨脹力を吸収し、ノズル３１よりの粘着性材料３３のたれを防止する。

第６図は本発明の第３の実施例を示す。本実施例は前記第１の実施例と同様に押出装置本体１の支承部２にカートリッジ型式の収容シリンダ３を支持せしめたものであり、駆動手段４を配設した駆動部５の構成も第１図ないし第３図に示すものと同一である。従って第６図中第１図ないし第３図と同一符号を付した部分は同一部分を示すものとし、その説明を省略する。

本実施例はピストン杆制動手段２０６の構成が前記第１の実施例および第２実施例と異る。即ちピストン杆制動手段２０６は、ピストン杆８の外径より若干大なる直径を有する係止孔２６１を長手方向のほぼ中央部に穿設形成した板状材よりなる係止片２６２を、前記係止孔２６１をピストン杆８に挿通し、その上端部に形成した通孔２６３と駆動部５の基体部５２に形成した通孔５６にピストン杆８の軸にほぼ平行となるように牽引杆２６４を摺動自在に挿通し、該牽引杆２６４の一端に螺装したナット２６６によって係止された止片２６７と基体部５２との間に前記牽引杆２６４の外周に沿って螺旋状のばね部材２６５を配設するとともに、前記牽引杆２６４の他端部に形成した係止頭部２６８によりばね部材２６５の弾力を係止片２６２に弾発せしめ、かつ前記係止片262と基体部５２との間に前記ピストン杆８の外周に沿う螺旋状とした第２のばね部材２６９を配設して、前記係止片２６２をピストン杆８の押進方向と反対方向に弾発せしめて、係止片２６２をピストン杆８の軸に関して鋭角に傾斜せしめ、係止孔２６１の周縁部がピストン杆８の外周面と摩擦的に係合するように構成せしめたものである。

本実施例においては、駆動手段４によるピストン杆８の押進が行われてピストン杆８がその軸方向の一方に押進せしめられるときは、係止片262はピストン杆８との摩擦的係合によりピストン杆８と共に第２のばね部材２６９を圧縮し、かつ第１のばね部材２６５の圧縮を解きながら移動し、第２のばね部材２６９が僅かに圧縮され、第１のばね部材２６５が若干伸長されたところで係止片２６２のピストン杆８の軸に対する傾斜角が変更されてピストン杆８との摩擦的係合が弱まり、係合片２６２をその位置に残したままピストン杆８は押進される。ピストン杆８が停止すると第２のばね部材２６９の弾力で係止片２６２がピストン杆８に再び摩擦的に係合され、収容シリンダ３内の圧縮された空気の膨脹力がピストン杆８にその押進方向と反対方向に作用するときは、係止片２６２はピストン杆８に摩擦的に係合した状態で前記押進方向と反対方向に第１のばね部材２６５を圧縮しつつ移動して前記圧縮された空気の膨脹力を吸収し、ノズル３１よりの粘着性材料３３のたれを防止する。本実施例における第２のばね部材２６９は係止片２６２の支点を兼ねるものであ

り、その弾力は第１のばね部材２６５の弾力より十分に大にされている。

なお前記第２実施例および第３実施例においても、第４図に示す２個の設計変更を単独に、または同時に施すことが可能である。

(ト)発明の効果

本発明においては、押出装置本体にピストン杆をその軸方向に摺動自在に支承し、該ピストン杆をその軸方向の一方向に押進せしめることにより、前記押出装置本体上に支承せしめた収容シリンダ内の粘着性材料を前記ピストン杆の先端部に配設したピストンにより押圧して、前記収容シリンダの前端に形成したノズルより押し出すようにした粘着性材料押出装置において、ピストン杆の外径より若干大なる直径を有する係止孔を形成し、該係止孔を前記ピストン杆に挿通して該ピストン杆の軸方向に摺動自在に、かつ前記押出装置本体に浮動的に支承された板状体よりなる係止片と、該係止片と前記押出装置本体との間に介装されて前記係止片を前記ピストン杆の軸に関して鋭角に傾斜せしめるように弾発するばね部材とからなり、該ばね部材の弾力により前記係止片の係止孔の周縁部を前記ピストン杆の外周面に摩擦的に係合せしめ、該ピストン杆の停止時および前記押進方向と反対方向への該ピストン杆の移動時に該ピストン杆と前記係止片との摩擦的係合を維持するようにしたピストン杆制動手段と、前記押出装置本体に浮動的に支承された係止片を前記押出装置本体に対し前記ピストン杆とともに予め定めた距離だけ移動することを許容する圧力緩和手段とからなるものであるから、収容シリンダ内の粘着性材料の押し出しのためピストン杆を停止位置からその軸方向の一方向に前記係合片の移動が許容される距離を超えて押進せしめるときは、係止片とピストン杆との間の摩擦的係合は弱められて、係止片をその位置に残してピストン杆のみ前記軸方向の一方に押進せしめられ、ピストンにより粘着性材料を押圧して収容シリンダ前端のノズルより押し出して粘着性材料を施工箇所に施すことができる。

粘着性材料を充填した収容シリンダ内には、粘着性材料の粘稠性のため空気を完全に排除することが不可能であるから、前記ピストン杆の押進の際収容シリンダ内に封入されている空気が圧縮されており、ピストン杆の押進を停止せしめた後に前記圧縮された空気が膨脹しようとする。この膨脹力は粘着性材料をノズルより押し出す方向に作用すると同時に前記ピストン杆にその押進方向と反対方向に作用する。本発明においては前記押出装置本体に浮動的に支承されている前記係合片をピストン杆の軸方向に予め定めた距離だけ移動することを許容する手段が設けられており、ピストン杆の押進の初期に係合片がピストン杆とともに前記押進方向に移動せしめられているから、ピストン杆は係止片とともに前記圧縮された空気の膨脹力により前記ピストン杆の押進方向と反対方向に移動することができ、ピストン杆のこの移動によって収容シリンダ内の空気の膨脹力を吸収して、収容シリンダ内の粘着性材料がノズルより押し出されることを防止する効果を有し、粘着性材料の損失ならびに操作者の身体や粘着性材料の施工箇所の周辺の汚損を防止するものである。

なお本発明においては、ピストン杆を押進せしめる駆動手段については図面に記載した駆動手段に限られないものであって、該駆動手段を作動せしめたときにはピストン杆をその軸方向の一方に押進せしめ、不作動時にはピストン杆の前記軸方向の一方と反対方向の移動を許容する駆動手段であればよいものであることはいうまでもない。

4.図面の簡単な説明

第１図ないし第３図は本発明の第１の実施例を示すもので、第１図はその使用状態の断面側面図、第２図はカートリッジ型式の収容シリンダを取り外した状態の側面図、第３図はその要部の正面図を示す。第４図は第１図の変形例の側面図、第５図は本発明の第２の実施例の使用状態の断面側面図、第５図は本発明の第３の実施例の使用状態の断面側面図を示すものである。

なお図中の符号はそれぞれ次の部分を示す。

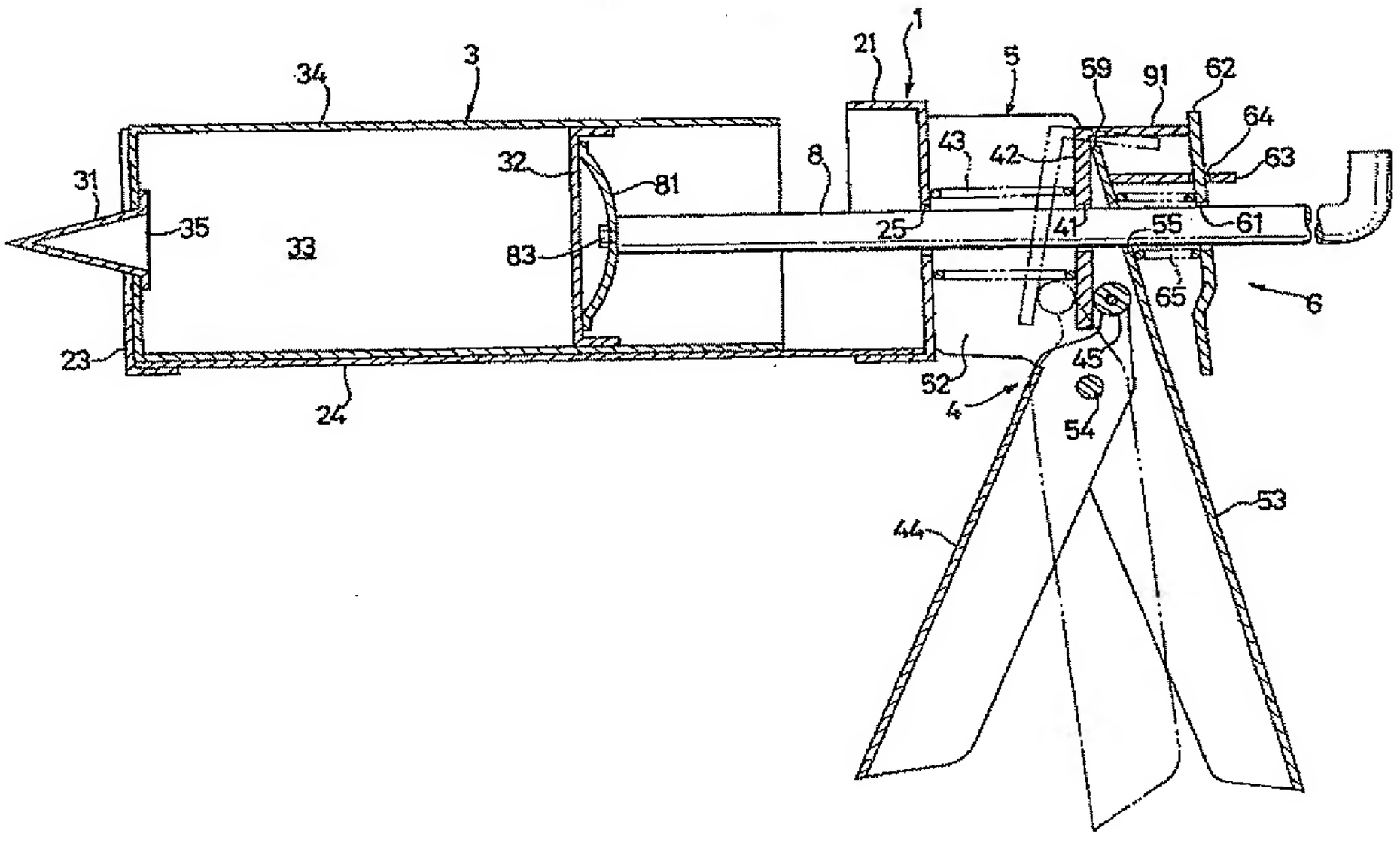
１：押出装置本体　　２：支承部

３：収容シリンダ　　４：駆動手段

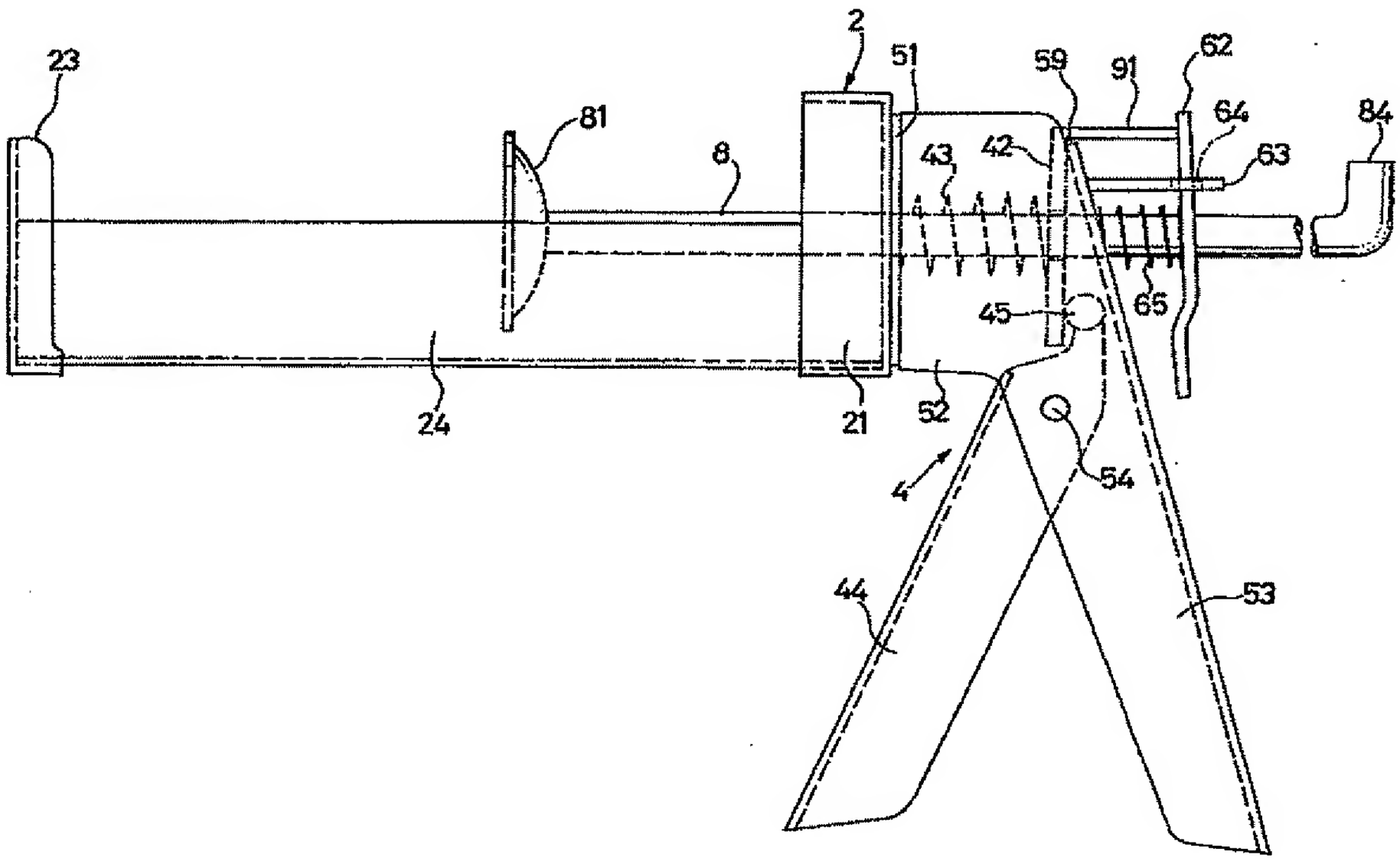
42：駆動片　　41：その係合孔
44，71：レバー　　45，73：円筒軸
62，162，262：係止片
61，161，261：その係止孔
65，165，265：ばね部材
63，169：支板　　8：ピストン杆

特許出願人　　キメダイン株式会社
代　理　人　　弁理士　鈴　木　昌　明

第　1　図



第　2　図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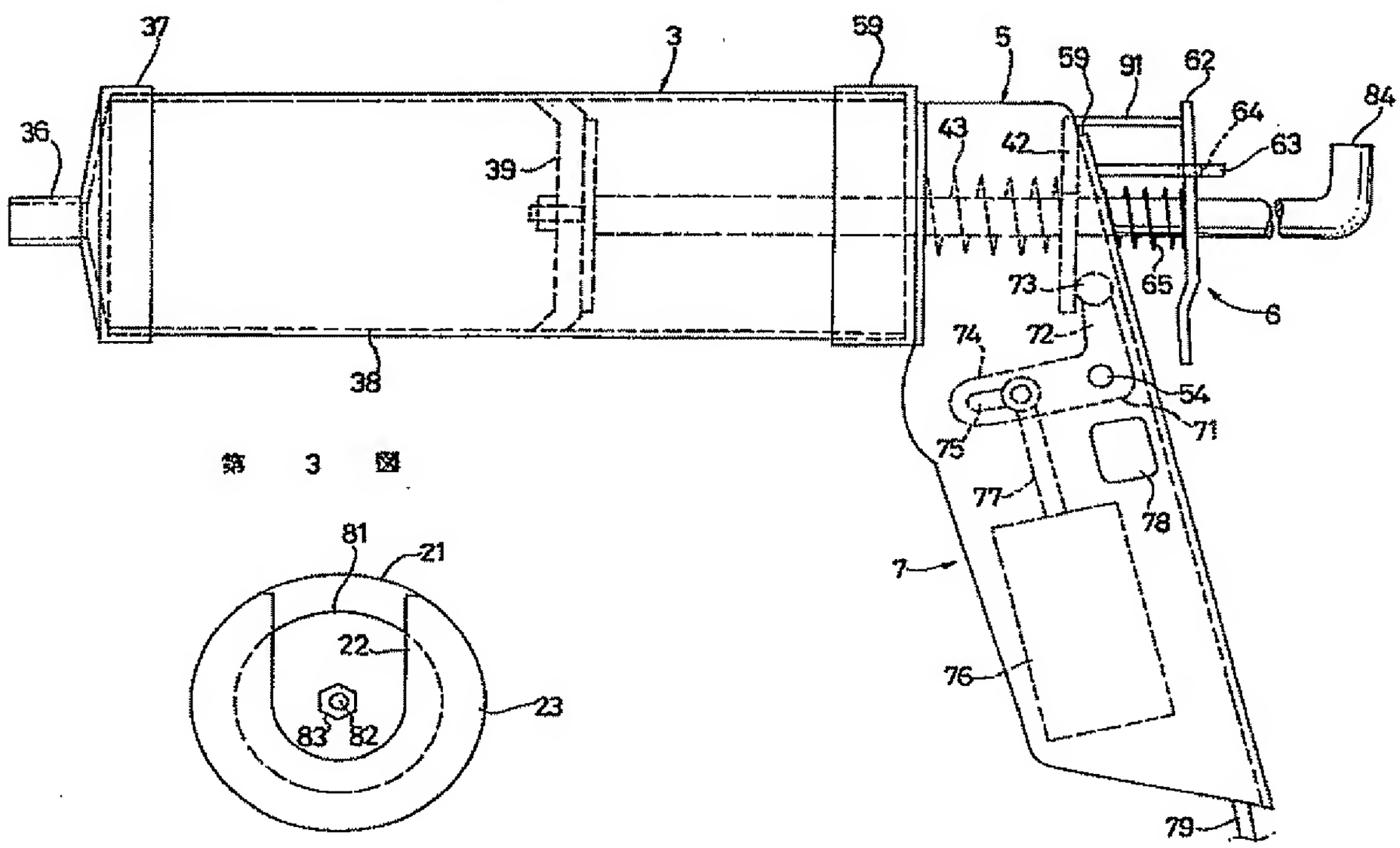
第　4　図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第　3　図

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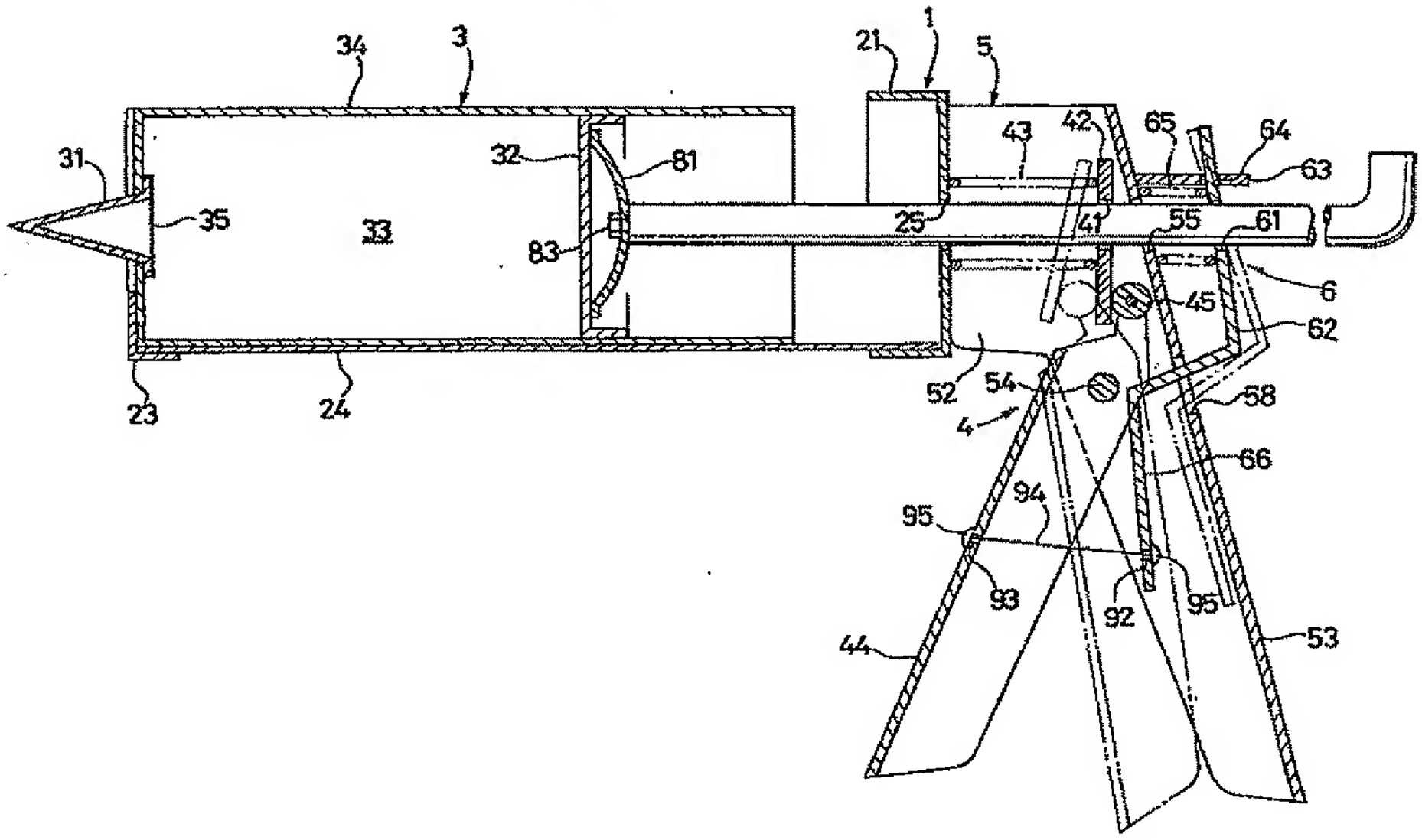
第　5　図



手 続 補 正 書

昭和60年 8 月14日

特許庁長官　宇　賀　道　郎　殿

1．事件の表示

昭和５９年特許願第１８８６４４号

2．発明の名称

粘着性材料押出装置におけるたれ防止装置
（ネンチャクセイザイリョウオシダシソウチ　タレボウシソウチ）

3．補正をする者

事件との関係　特許出願人

住　所（ﾌﾘｶﾞﾅ）　東京都品川区東五反田４丁目５番９号（シナガワクヒガシ　ゴタンダ）

氏　名（名称）セメダイン株式会社

4．代　理　人　〒１０２

住　所　東京都千代田区麹町５丁目７番地

秀和紀尾井町テイ・ビー・アール１２２０

電話<０３>２６２－１７１５

氏　名　（６７２５）弁理士　鈴　木　昌　明

5．補正の対象

明細書の図面の簡単な説明の欄および願書に添付の図面

6．補正の内容

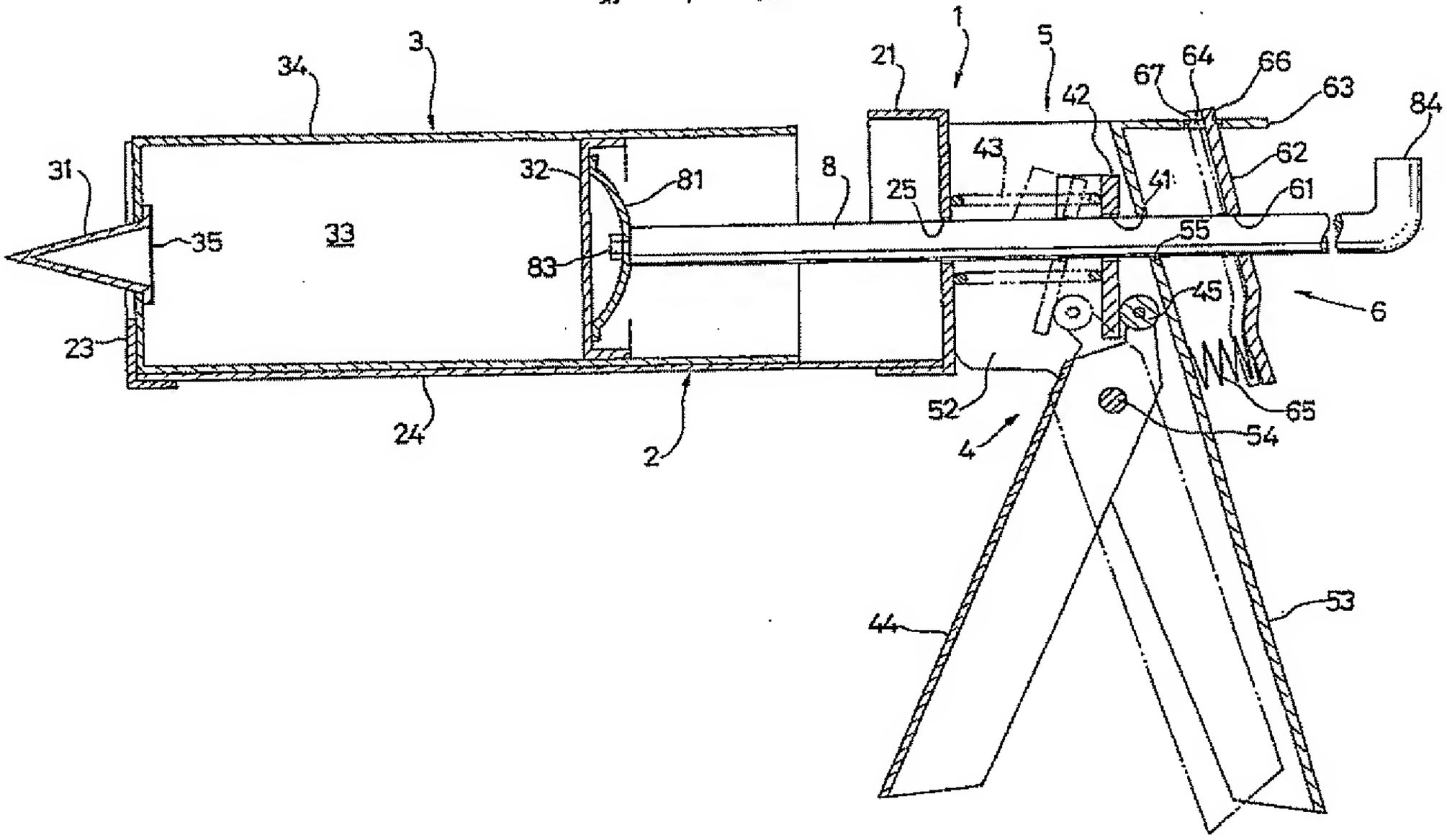
（１）明細書第３０頁第１６行に記載の「第５図」を、「第６図」に補正する。

（２）願書に添付の図面中第１図ないし第５図を別紙のとおりに補正し、第６図を別紙のとおり提出する。

方式　(広沢)

60. 8. 14

第 1 図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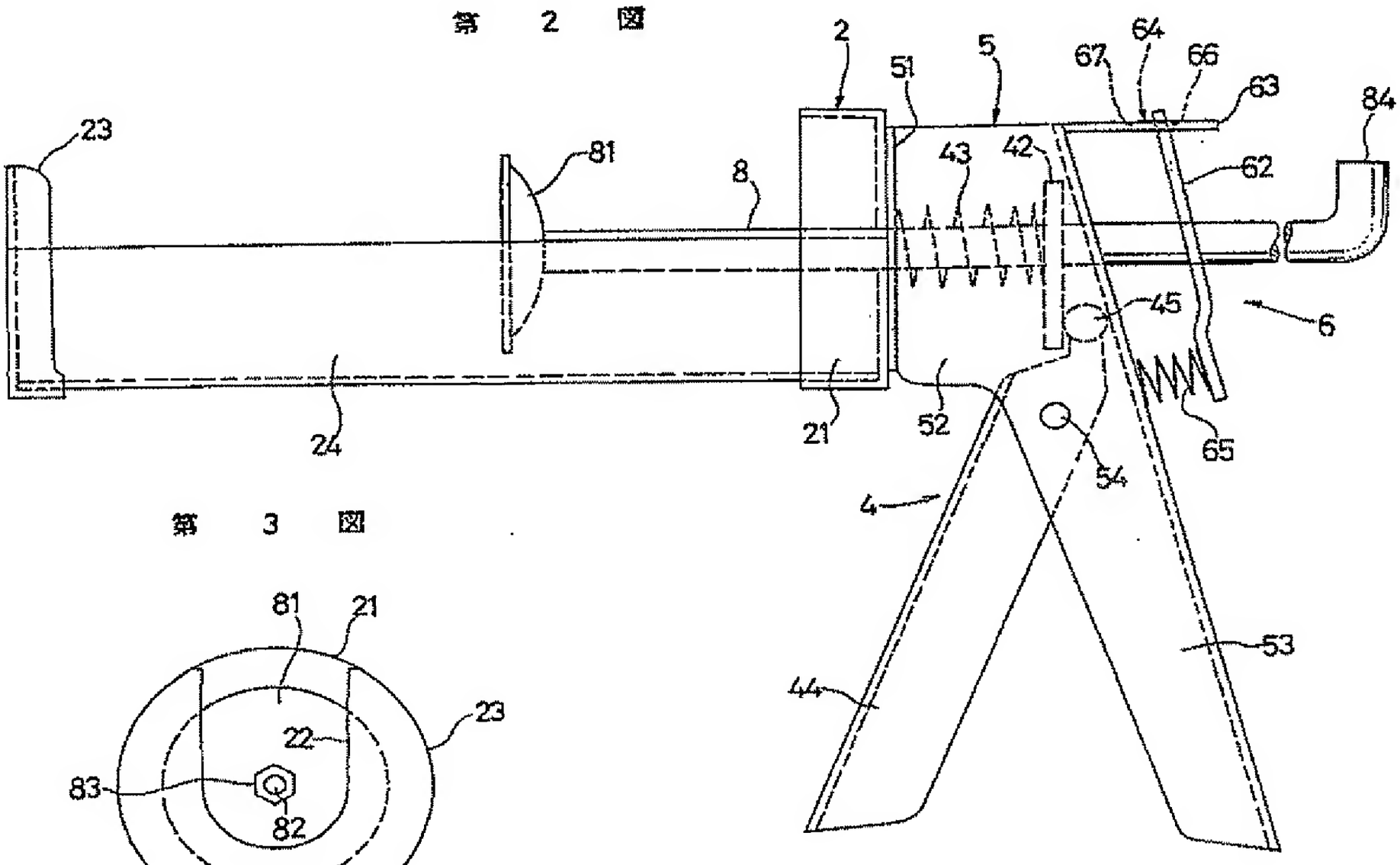
第 2 図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第 3 図

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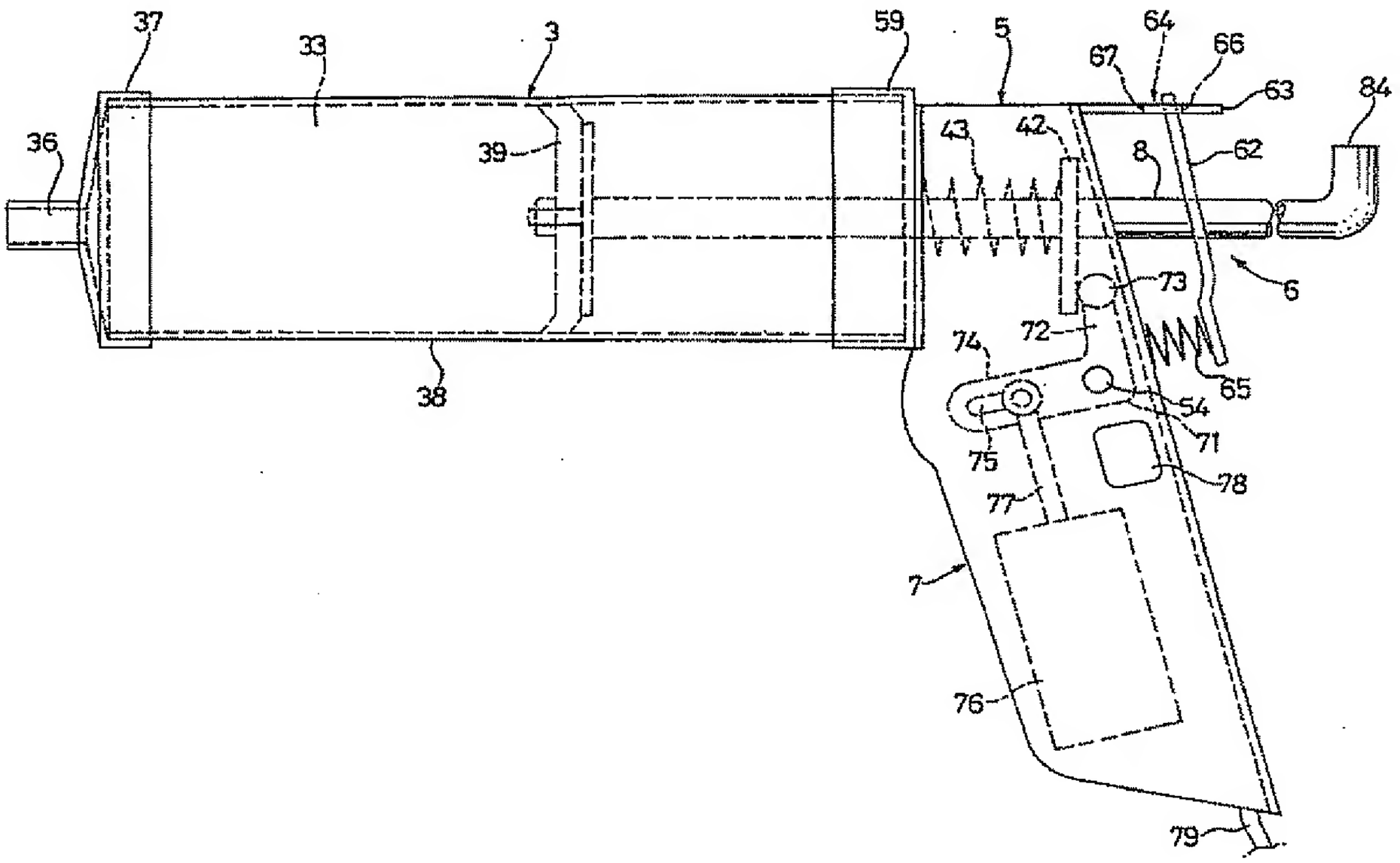
第　4　図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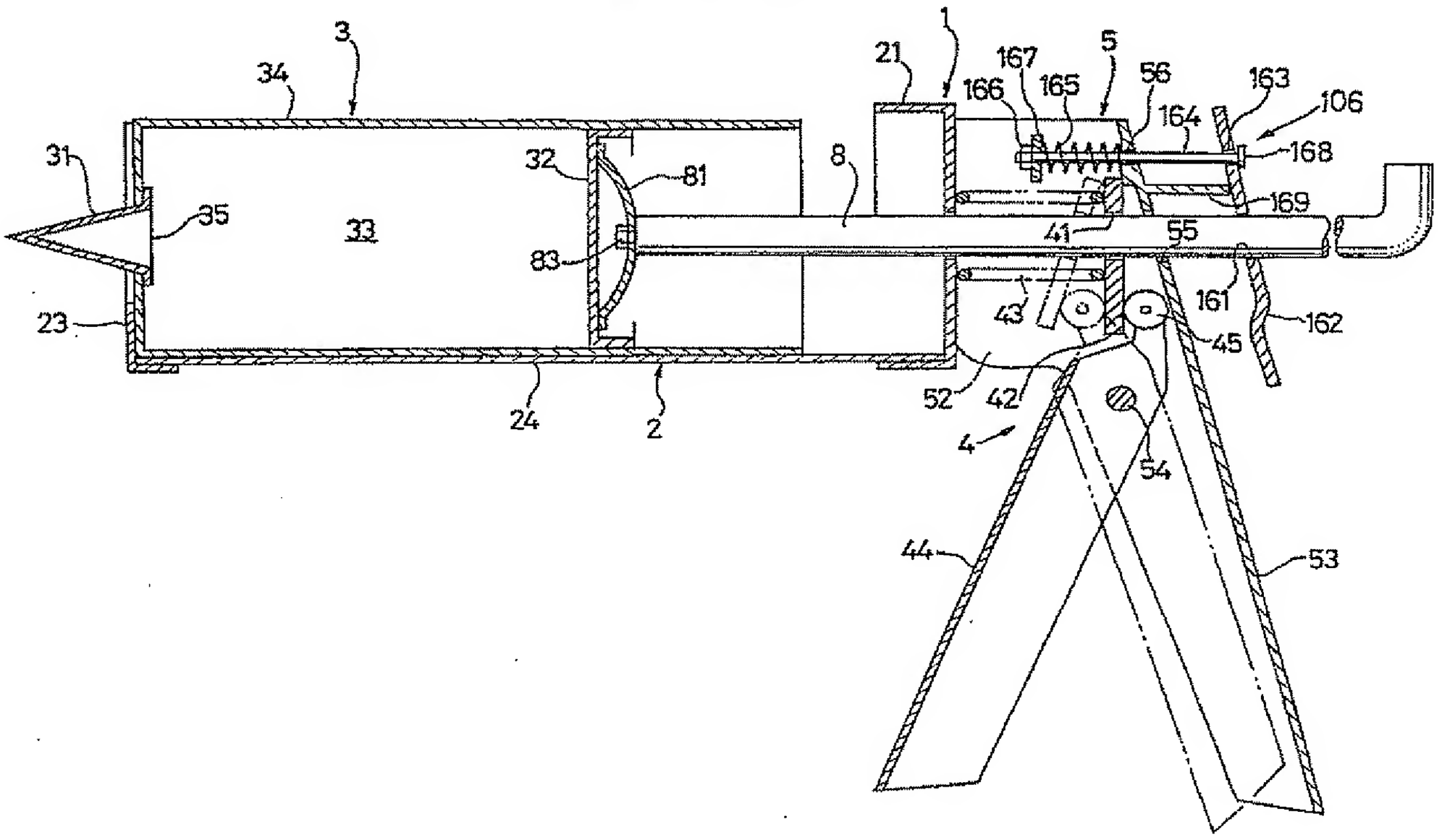
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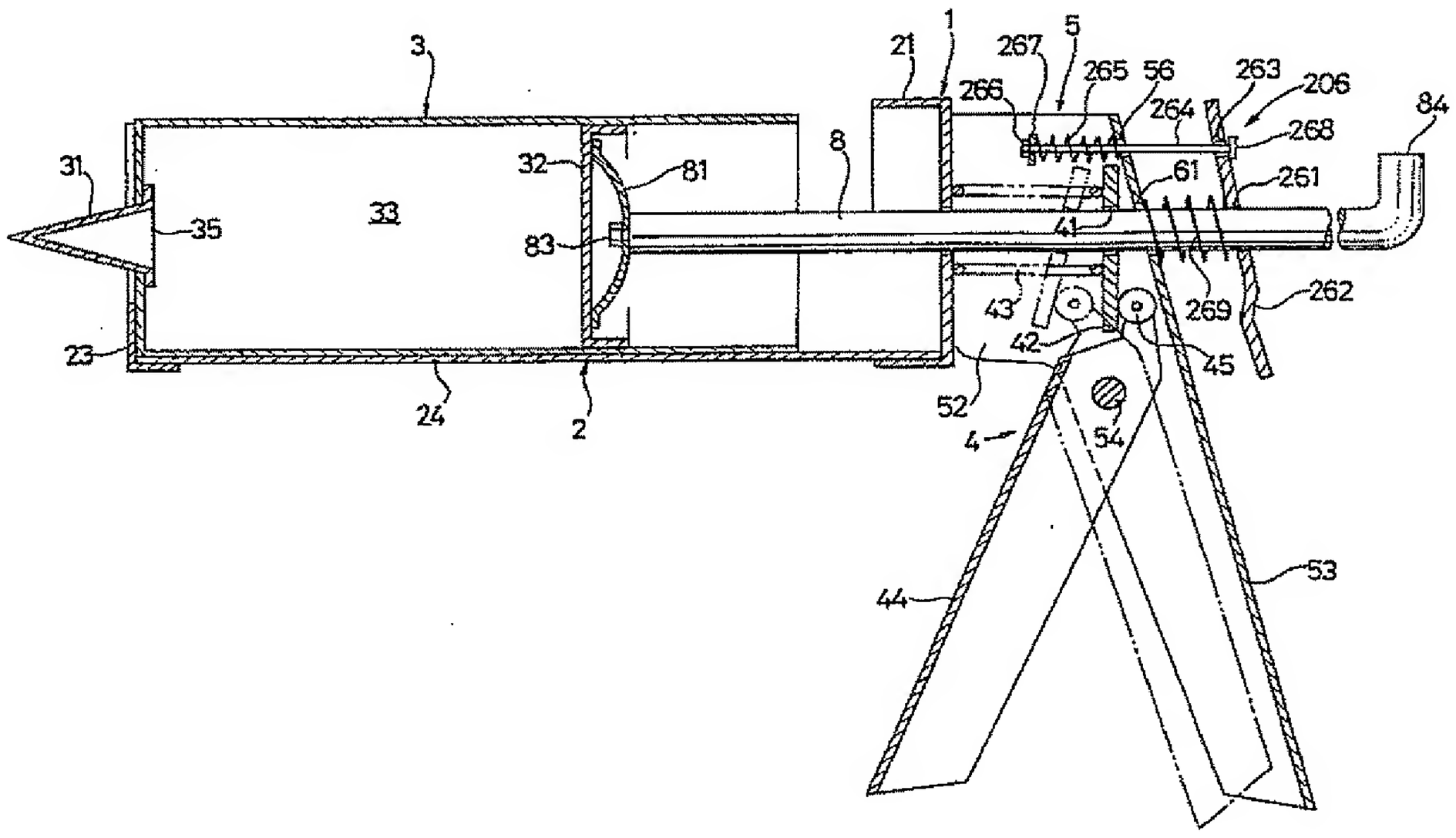
第 6 図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United States Patent [19]

Ikeda et al.

[11] **Patent Number: 4,681,524**

[45] **Date of Patent: Jul. 21, 1987**

[54] **EXTRUSION DEVICE**

[75] Inventors: **Shigeru Ikeda**, Yuki; **Naomi Okamura**, Kuki, both of Japan

[73] Assignee: **Cemedine Co., Ltd.**, Tokyo, Japan

[21] Appl. No.: **773,548**

[22] Filed: **Sep. 9, 1985**

[30] **Foreign Application Priority Data**

Sep. 8, 1984 [JP] Japan 188644

[51] **Int. Cl.**[4] **B29C 47/00**

[52] **U.S. Cl.** ..... **425/376 R**; 222/326; 222/341; 222/391; 425/458

[58] **Field of Search** ..... 222/325-327, 222/338, 341, 386, 391; 425/376 R, 458, DIG. 5, 87; 74/141.5, 148

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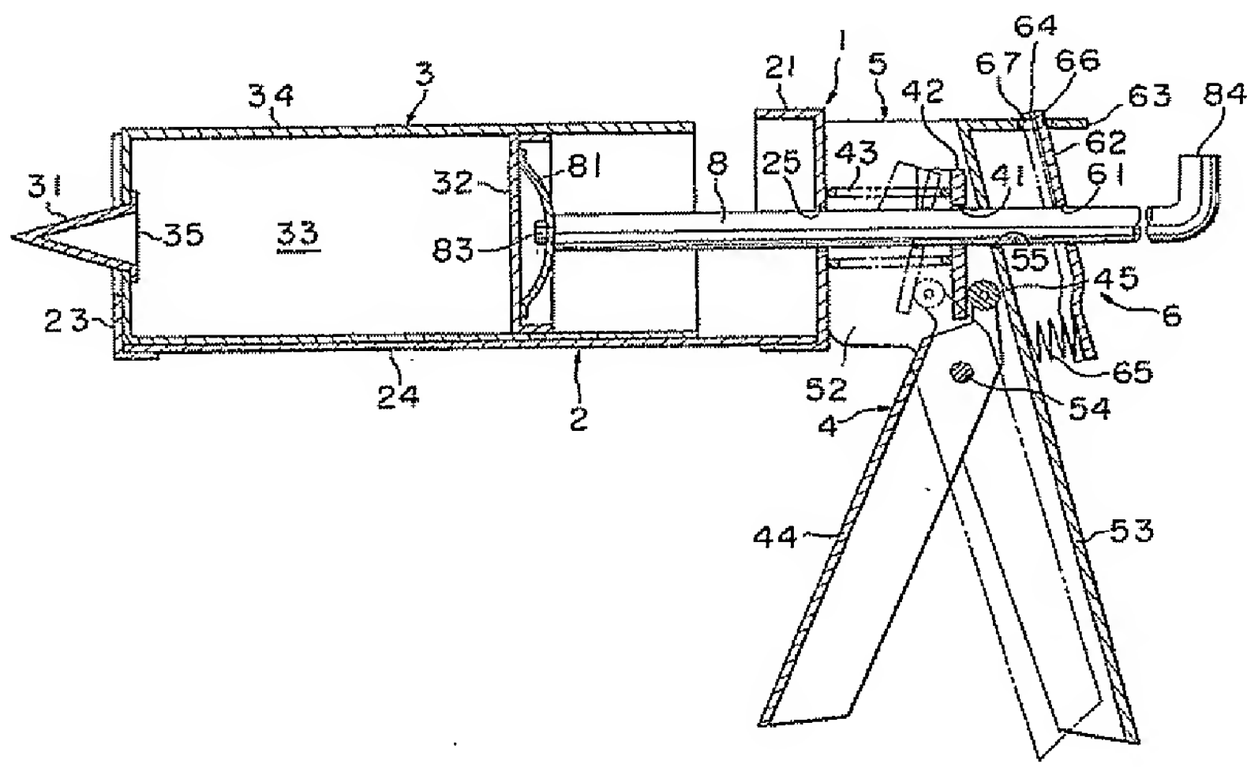
31013	10/1971	Japan .
11964	3/1980	Japan .

Primary Examiner—Jay H. Woo
Assistant Examiner—J. Fortenberry
Attorney, Agent, or Firm—Oblon, Fisher, Spivak, McClelland & Maier

[57] **ABSTRACT**

A push rod is forwarded to extrude viscous material in a tubular container from the nozzle. When the extrusion of viscous material is finished, i.e. stopping the forward operation of the push rod, the push rod is allowed to go back by a force resulted by expansion of air unavoidably contained, in the tubular container thereby absorbing expansion of air so as to prevent unwanted discharge of the viscous material due to an inner pressure of the tubular container.

17 Claims, 11 Drawing Figures



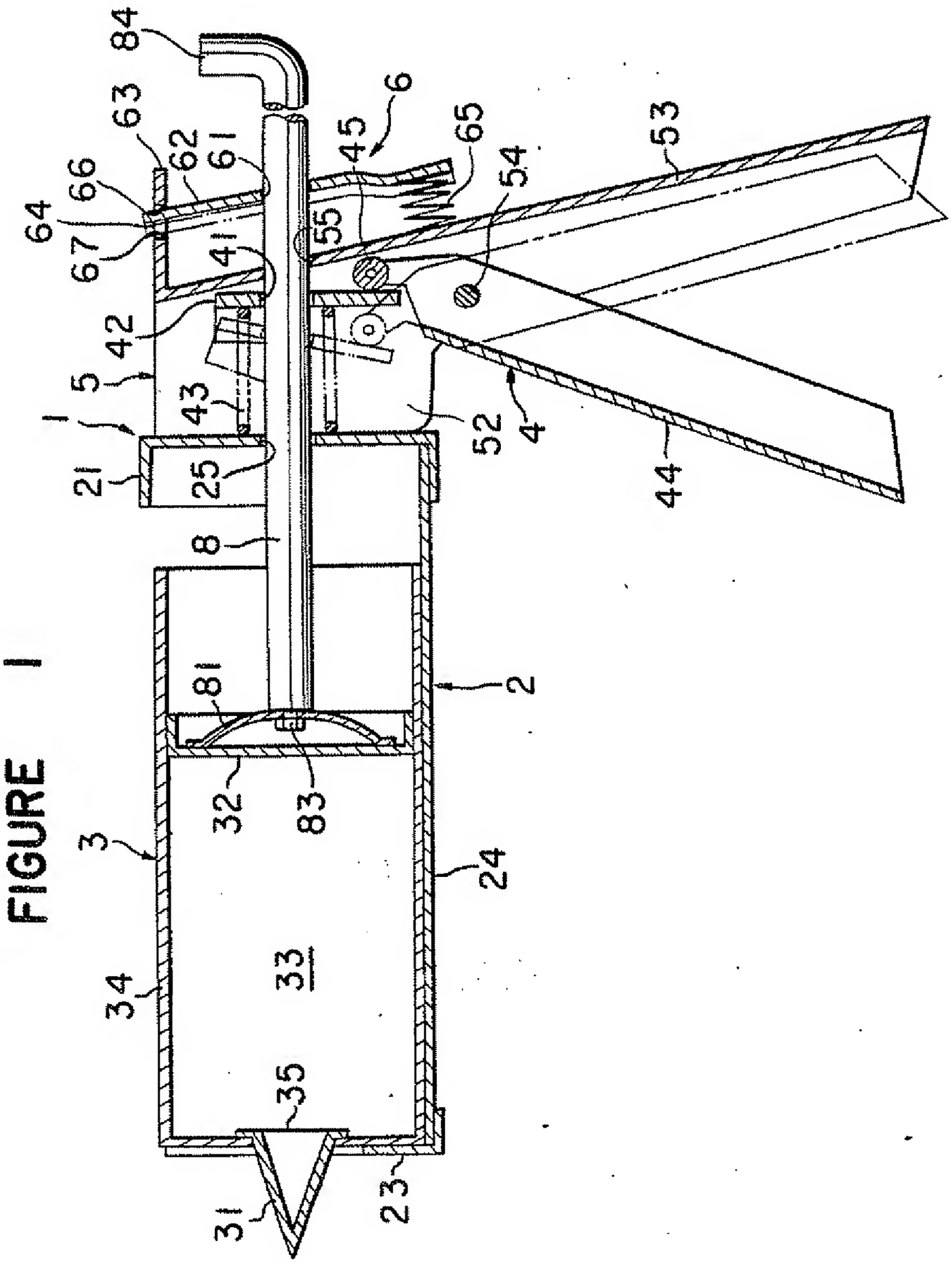

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FIGURE 1

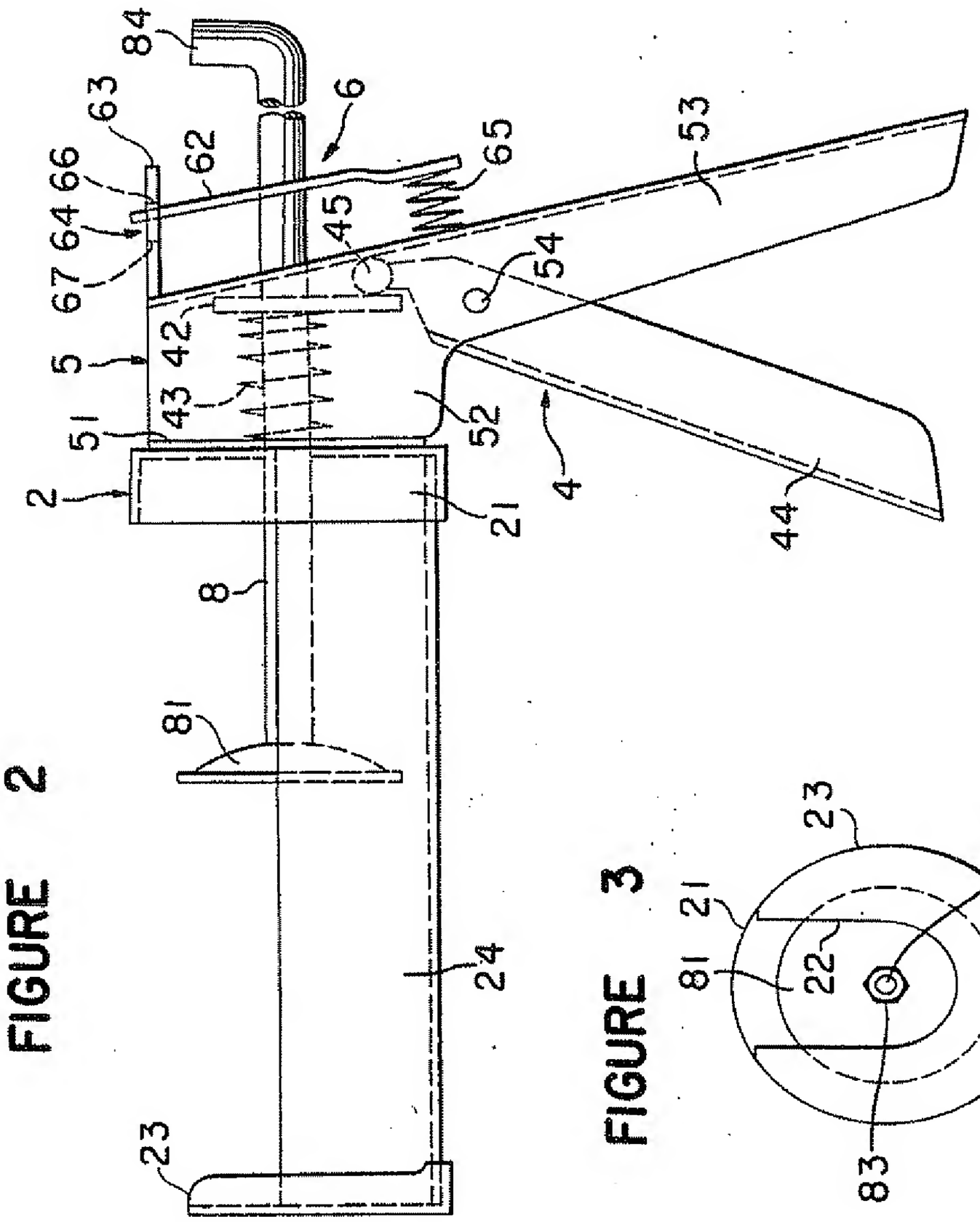

FIGURE 2

FIGURE 3

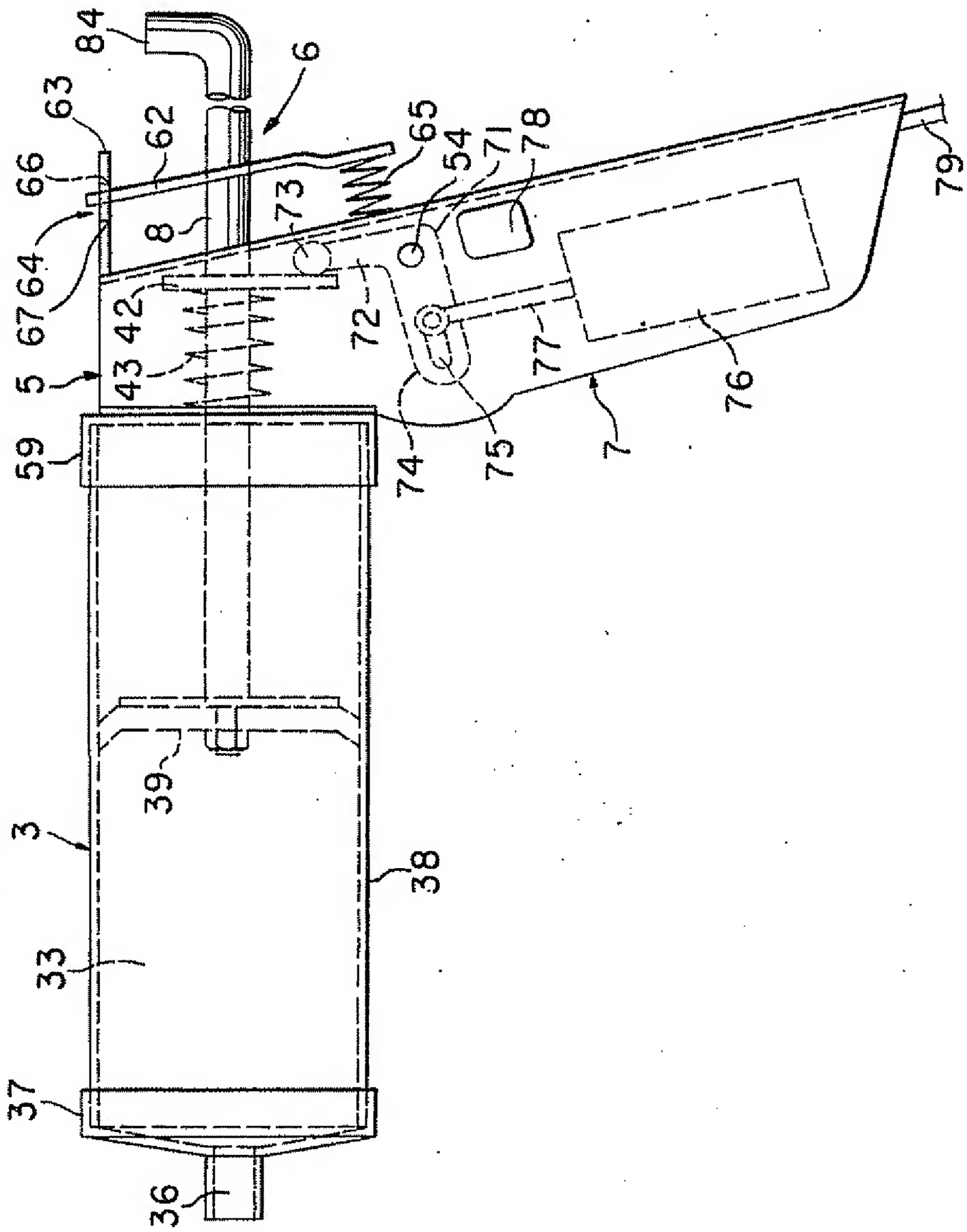
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FIGURE 4

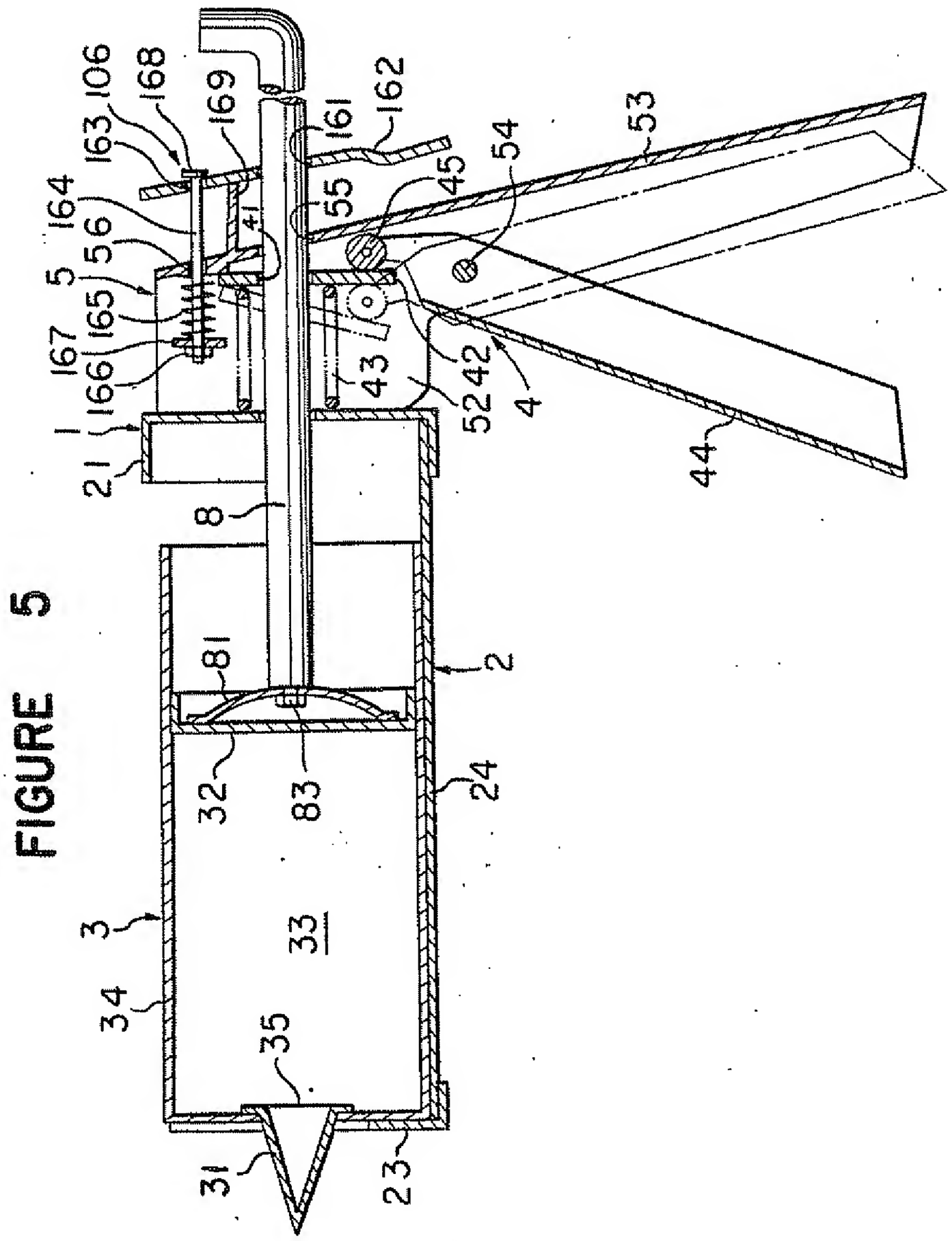
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FIGURE 5

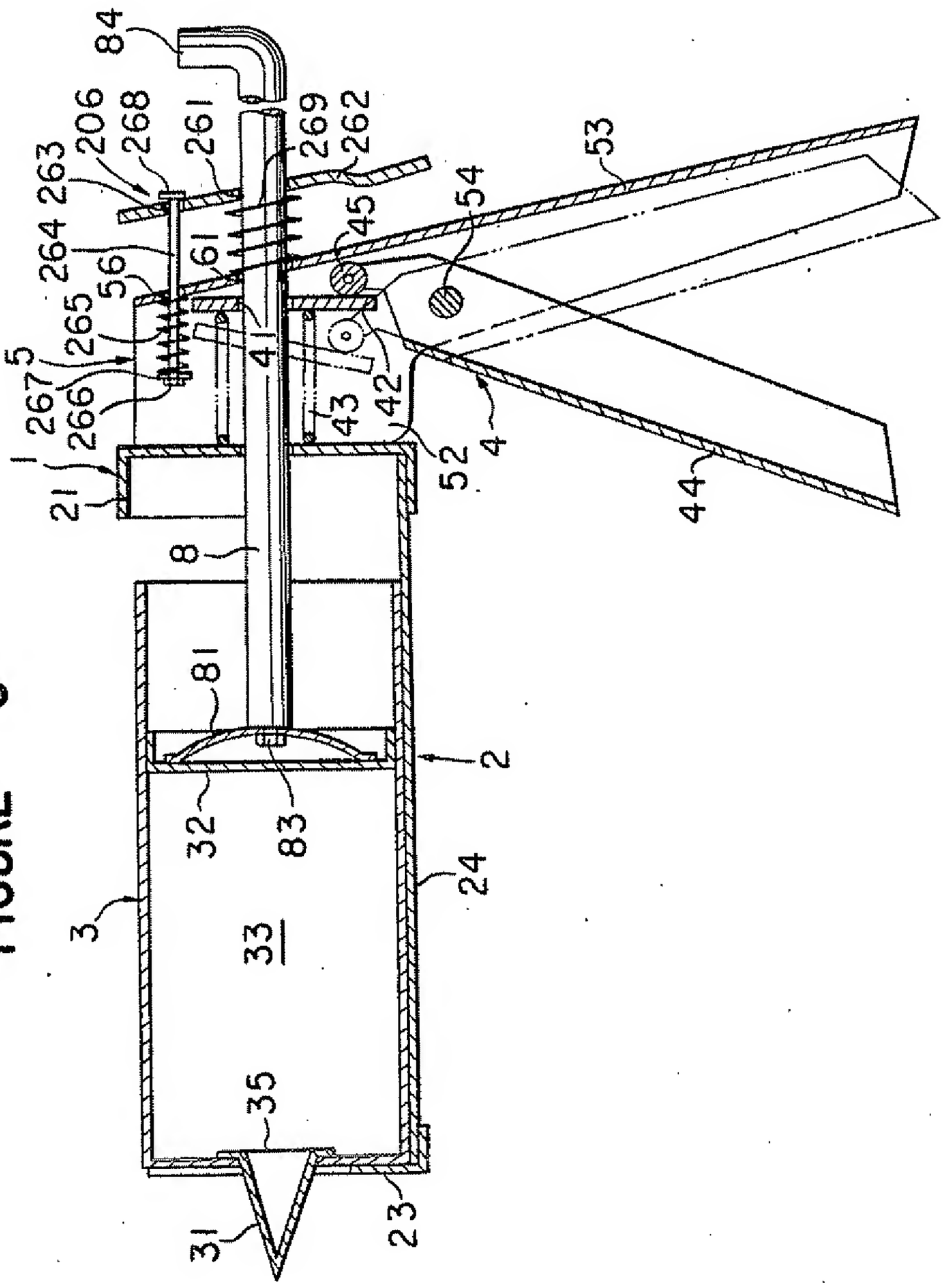
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FIGURE 6

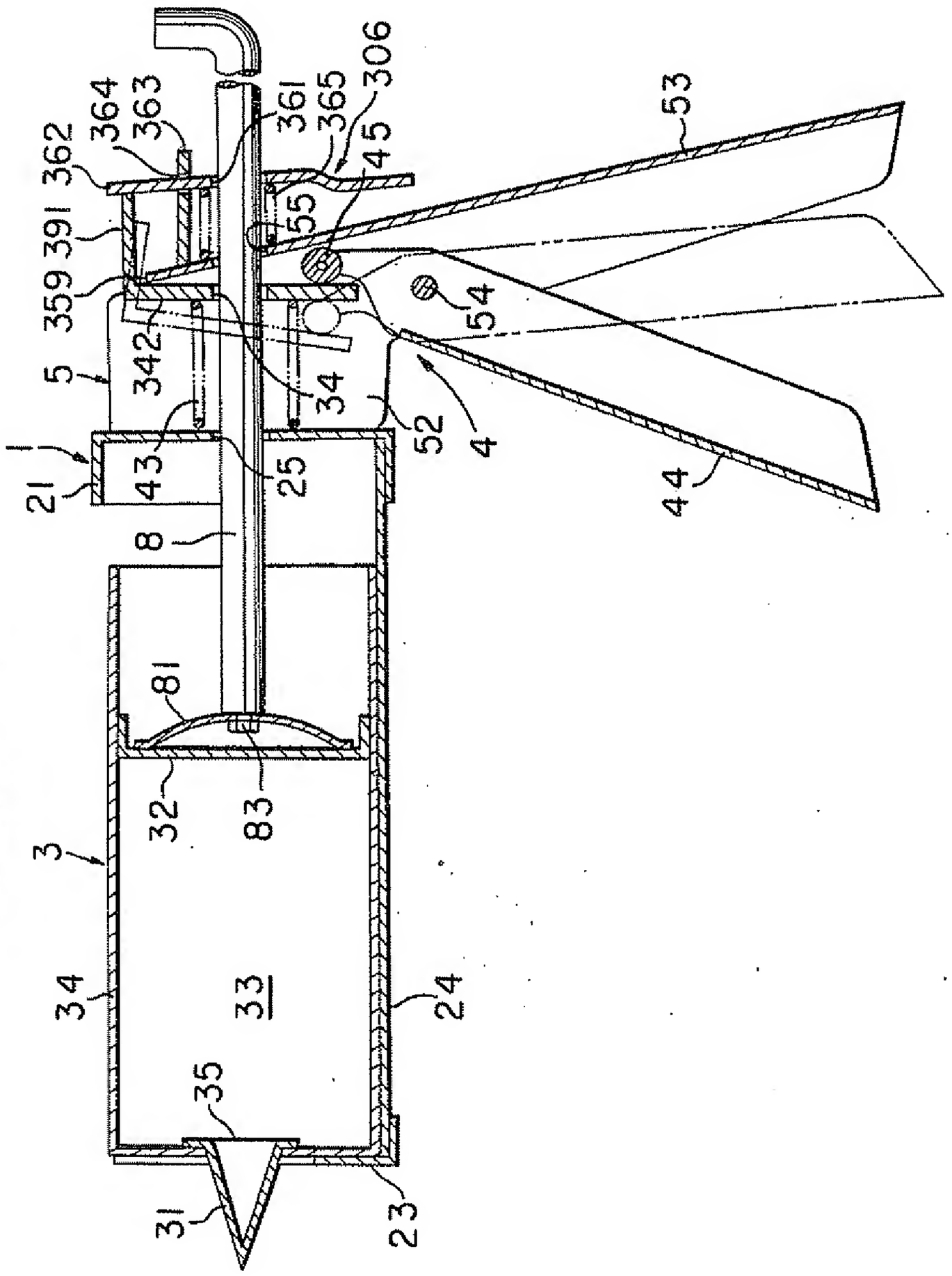
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FIGURE 7

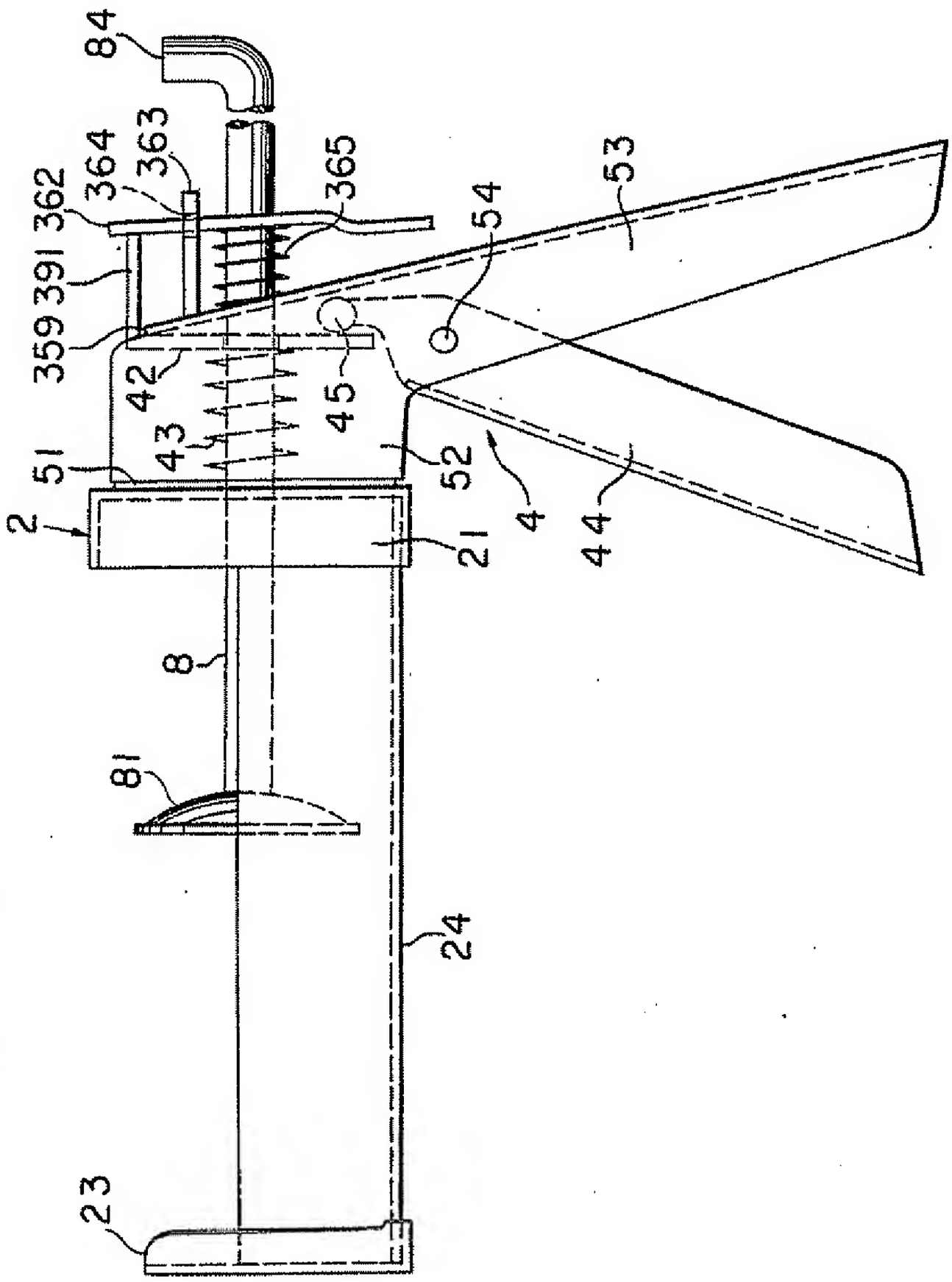

FIGURE 8

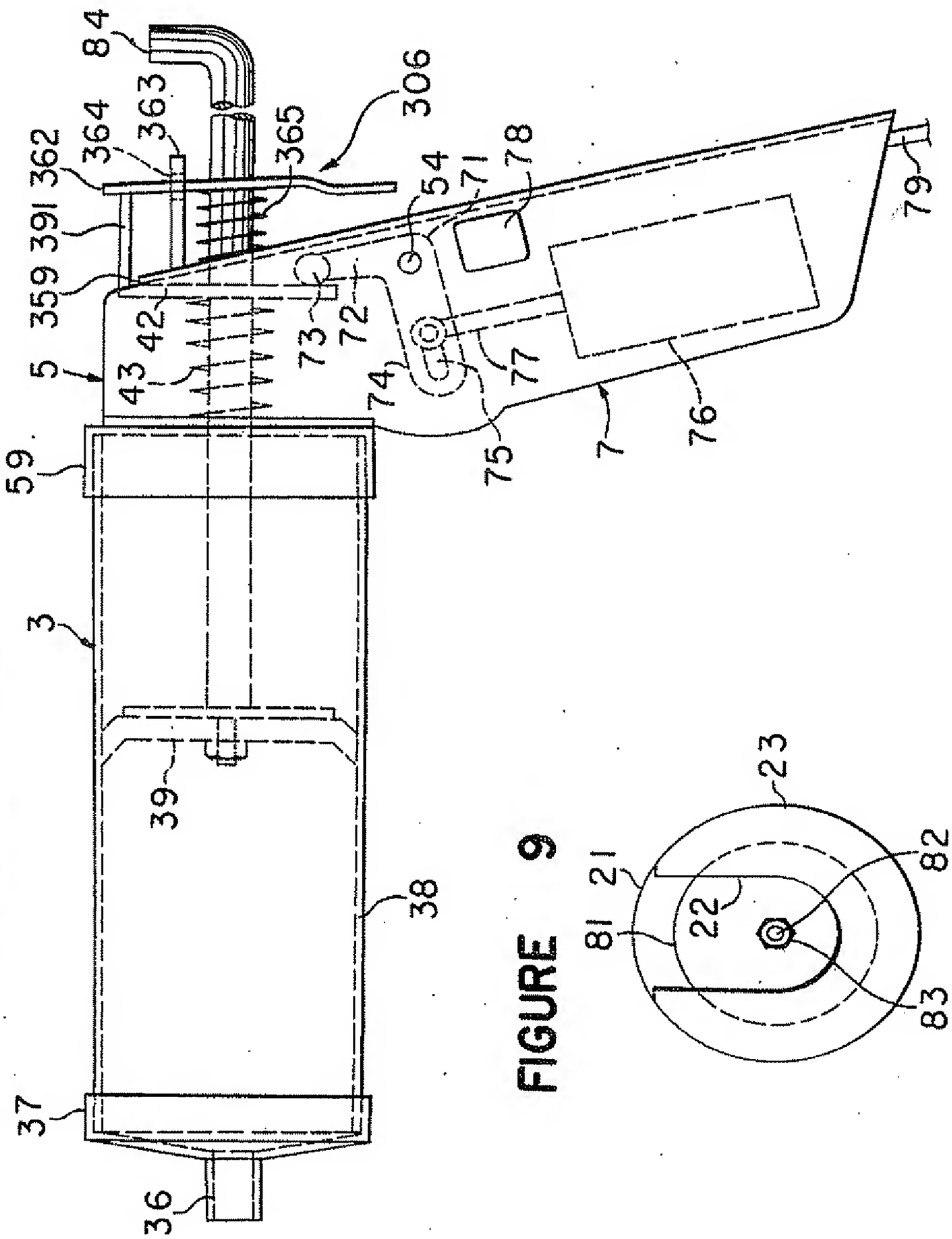

FIGURE 10

FIGURE 9

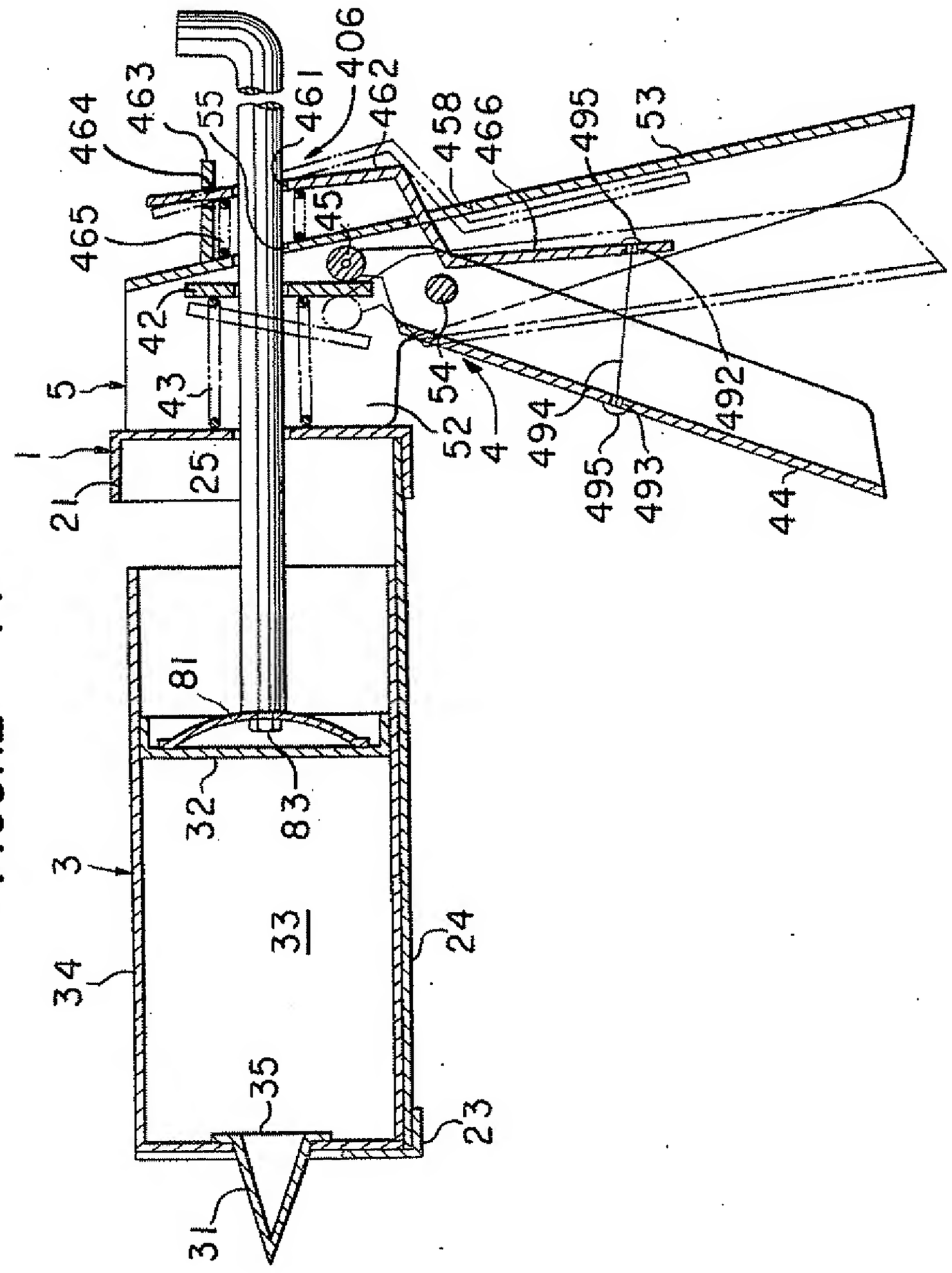
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FIGURE 11

EXTRUSION DEVICE

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to an extrusion device for extruding highly viscous material such as an adhesive agent, a gap-filling material, an adhesive gap-filling material, grease and so on from a tubular container to apply it to an object. More particularly, it relates to an extrusion device which prevents undesirable discharge of the viscous material from the nozzle.

2. Description of Prior Art

Caulking guns and grease guns have been known as devices for extruding highly viscous material from a tubular container. For instance, a caulking gun, which is used for filling a gap or a joint portion in panels and building materials for buildings and containers with a highly viscous liquid gap-filling material or an adhesive gap-filling material by extruding it from a tubular container, is disclosed in Japanese Examined Utility Model Publications 31013/1971 and 11964/1980. The caulking gun is constructed in such a manner that a tubular container containing a viscous gap-fitting material is formed integrally with the main body or a cartridge type tubular container is fitted to the main body and a push rod is supported by the main body so as to be slidable along the axial direction of the main body, wherein the gap-filling material in the tubular container is extruded from a nozzle formed at the front end of the tubular container by a piston member attached at the end of a push rod when the push rod is urged in one direction along the axial direction.

A driving unit as means for urging the push rod generally comprises a driving piece formed of a plate-like body in which an opening having a diameter slightly greater than the outer diameter of the push rod is formed, the driving piece being supported by inserting the push rod in the opening so that it is slidable in the axial direction and inclinable with respect to the axial direction of the push rod, a coil spring interposed between the main body of the extrusion device and the driving piece and wound around the outer circumferential part of the push rod so that the driving piece is pushed in the opposite direction opposite the forwarding direction of the push rod, and a lever pivotally supported by the extrusion device main body which pushes an end of the driving piece in the forwarding direction of the push rod when the lever is operated.

The operation of the driving unit is such that when an end of the driving piece is pushed by turning the lever in one direction, inclination of the driving piece is caused with respect to the push rod whereby a circular edge portion of the opening is frictionally engaged with the outer circumference of the push rod. Namely, the push rod is pushed together with the driving piece against the spring action of the coil spring.

The conventional extrusion device is provided with a control means for controlling the push rod. The control means generally comprises a control piece in which a control opening having a diameter slightly greater than the outer diameter of the push rod is formed, the push rod being inserted in the control opening and one end of the control piece being turnably supported by a supporting plate made of a plate-like material projecting from the extrusion device main body, and a coil spring interposed between the main body and the control piece and wound around the outer circumferential surface of

the push rod to effect the spring action in the direction opposite the forwarding direction of the push rod. The spring action of the coil spring causes the control piece to turn around a point supported by the supporting plate so that the control piece inclines with respect to the axial direction of the push rod with the result that an circular edge portion of the control opening is frictionally engaged with the outer circumference of the push rod. In this case, when the push rod is forwardly pushed by the driving unit, the push rod is allowed to move because the coil spring is compressed. However, when the push rod is moved in the direction opposite the forwarding direction, the movement is prevented due to the frictional engagement between the control opening and the outer circumferential surface of the push rod. Accordingly, when an operator operates the lever, the push rod is pushed forwardly whereby the gap-filling material is extruded from the nozzle formed at the front end of the tubular container. On the other hand, when the operator stops the operation of the lever, the lever returns to the original position together with the driving piece by the spring action of the coil spring, while the push rod is retained at the forwarding position due to the frictional engagement with the control piece of the control means.

Thus, in the conventional extrusion device, when the forwarding movement of the push rod is once stopped, the push rod is retained at a position of stop by the control means. For instance, after completion of work for filling a gap between a pair of panels, when operation of the driving means is stopped, the push rod is retained at the stopped position. Then, when the driving means is operated for filling a gap in another pair of panels, the gap-filling material in the tubular container is immediately extruded from the nozzle. In this case, however, there has been frequently occurred unwanted discharge of the gap-filling material, namely, the gap-filling material in the tubular container is slowly extruded from the nozzle even though the operation of the driving means is stopped to stop the extrusion of the gap-filling material. The unwanted discharging phenomenon for the gap-filling material remarkably takes place as viscosity of the material is high. The unwanted discharge of the gap-filling material causes contamination of an object to be worked when application of the gap-filling material is stopped due to a trowelling treatment, masking with a tape and so on. There also takes place contamination of a floor surface and devices in the vicinity of the object to be worked when the operator moves another place for working and contamination of clothes of the operator and the operator himself. Further, it causes loss of the gap-filling material. In addition, when the gap-filling material contains organic solvents, there takes place problems of firing and working conditions for laborors.

According to study by the inventors of the present invention, unwanted discharge of the viscous material such as the gap-filling material is caused owing to an inner pressure of the tubular container and viscoelasticity of the viscous material in the case that operation of the driving means is stopped to retain the push rod at a position of stop by means of the control means in the extruding of the viscous material in the tubular container. Further, according to study by the inventors, it has been found that when the viscous material is to be filled in the tubular container, air remains inside the tubular container, especially in the vicinity of the slid-

able bottom due to viscosity of the material. The air is compressed by the forwarding movement of the push rod. When the movement of the push rod is stopped, expansion of the compressed air and viscosity of the material slowly extrudes it from the nozzle.

In a case that a tubular container is formed integrally with the extrusion device main body, it is unavoidable that air remains in the tubular container when viscous material is sucked or filled in the tubular container from its end portion after viscous material previously filled in the container has been exhausted.

In a case of the extrusion device in which a cartridge type tubular container filled with viscous material is fitted to the extrusion device main body, it is unavoidable that some amount of air remains at a circular edge portion of the slidable bottom and inner wall of the tubular container because the viscous material is filled in the tubular container in a string form due to its viscosity when the viscous material is packed in the container. Accordingly, it is impossible to remove the residual air from the cartridge type tubular container before use of it. Further, it has been found that it takes much time to fill the viscous material in the cartridge type tubular container without leaving air in it and that it is impossible to evacuate air remaining in the cartridge type tubular container for a relatively short time without causing hardening of the viscous material.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide an extrusion device which prevents unwanted discharge of the viscous material when extruding operation is stopped.

The foregoing and the other objects of the present invention have been attained by providing an extrusion device for extruding viscous material which comprises: (a) a main body of the extrusion device adapted to receive a tubular container containing viscous material, the tubular container having a nozzle at the front end and a slidable bottom at the rear end; (b) a push rod supported by the main body so as to be slidable in the axial direction of the main body, so that the viscous material in the tubular container is extruded from the nozzle when the slidable bottom is pushed toward the nozzle by the push rod; (c) a push rod control means comprising a control piece formed of a plate-like material having a control opening of a diameter slightly larger than the outer diameter of the push rod to receive the push rod so as to be slidable in the axial direction of the push rod and a part supported by the main body so as to be inclinable, and a spring member interposed between the control piece and the main body to act on the control piece to be inclined at an angle with respect to the axis of the push rod so that frictional engagement between a circular edge portion of the control opening of the control piece and the outer circumferential surface of the push rod is established, and the frictional engagement is maintained when the push rod is stopped or is moved in the direction opposite the forwarding direction of the push rod; and (d) a pressure releasing means which causes the push rod to move in the direction opposite the forwarding direction.

BRIEF DESCRIPTION OF DRAWING

FIG. 1 is a longitudinal cross-sectional view of a first embodiment of the extrusion device of the present invention;

FIG. 2 is a side view showing the first embodiment of the present invention in which a cartridge type tubular container is removed;

FIG. 3 is a front view of a part of the extrusion device in FIG. 1;

FIG. 4 is a side view of a second embodiment of the present invention;

FIG. 5 is a longitudinal cross-sectional view of a third embodiment of the present invention;

FIG. 6 is a longitudinal cross-sectional view of a fourth embodiment of the present invention;

FIGS. 7 to 9 show a fifth embodiment of the present invention in which FIG. 7 is a longitudinal cross-sectional view of an extrusion device;

FIG. 8 is a view similar to FIG. 7 provided a tubular container being removed.

FIG. 9 is a front view of a part of the extrusion device shown in FIG. 7;

FIG. 10 is a front view of a sixth embodiment of the present invention; and

FIG. 11 is a longitudinal cross-sectional view of a seventh embodiment of the present invention.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

FIGS. 1 to 3 show the first embodiment of the present invention in which a cartridge type tubular container 3 is supported by a receiving part 2 of an extrusion device main body 1. The extrusion device main body 1 is provided with a driving part 5 having a driving means 4 and a push rod control means 6 as well as the receiving part 2. The receiving part 2 is constituted by a base member 21 adjacent to the driving part 5, the base member being formed by stamping a metal plate into a shallow bottomed circular tube, a head part 23 made of a metal plate having a U-shaped notch 22 (see FIG. 3) and a cylindrical edge at the circular portion, and a bottom plate 24 of a metal plate having a semicircular wall, the bottom plate being connected to the base member 21 and the head part 23 by welding. Namely, the extrusion device main body 1 has a general configuration of bottomed cylinder with a half of the cylindrical wall portion removed and is adapted to receive the cartridge type tubular container 3 which is provided with a conical nozzle 31 of synthetic resin at the front end and a slidable bottom 32 at the rear end to thereby form a tubular container main body 34 in which viscous material 33 is contained. The cartridge type tubular container 3 is put on the bottom plate 24 placing the nozzle 31 through the U-shaped notch 22 of the head part 23. The tubular container 3 is previously filled with the viscous material 33 in a factory. For use of the viscous material, the top end of the nozzle 31 is cut to form a nozzle opening and a sealing 35 such as aluminum foil attached the bottom of the nozzle 31 is broken.

A through hole 25 is formed at the center of the base member 21 of the receiving part 2 and a push rod 8 is inserted in the through hole 25 so as to be slidable along the central axial direction of the bottom plate 24 having a semicircular bottom wall. A threaded portion 82 is formed at the distal end of the push rod 8, and a disk-like pressing member 81 made of a metal plate is fitted to the end of the push rod 8 and secured by a nut 83 screw-engaged with the threaded portion. A knob portion 84 is formed at the other end of the push rod 8 by bending the other end portion.

The driving part 5 has a base portion 52 having a generally U-shape in cross section and a grip portion 53

having a generally U-shape in cross section continuous to the base portion **52** and a fitting edge **51** at an end of the base portion **52**, all of which is formed by stamping a metal plate integrally. The driving part **5** is connected to the bottom of the base member **21** of the receiving part **2** by welding the fitting edge **51**. Inside the base portion **52** of the driving part **5**, there is provided a driving piece **42**. The driving piece **42** is in a rectangular shape made of a relatively thick plate-like material in which a through hole **41** having a diameter slightly greater than the outer diameter of the push rod **8** is formed. The driving piece **42** is supported by the push rod **8** by insertion of the push rod **8** in the through hole **41** so that the driving piece is slidable in the axial direction of the push rod **8** and movable with respect to the push rod **8** with some clearance between the through hole **41** and the outer circumference of the push rod **8**. A coil spring **43** is interposed between the driving piece **42** and the base member **21** of the receiving part **2** and around the push rod **8** to push the driving piece **42** in the direction away from the base member **21**. A pin **54** is provided near the joint portion between the base portion **52** of the driving part **5** and the grip portion **53**. The upper part of a lever **44** which is formed by stamping a metal plate into a U-shape in cross section is journaled by the pin **54**. A cylindrical post **45** is attached to the top of the lever **44** so as to oppose the lower part of the driving piece **42**. Accordingly, when the lever **44** is turned toward the grip portion **53**, the cylindrical post **45** pushes the driving piece **42** against the spring action of the coil spring **43**.

When the driving piece **42** is pushed by the cylindrical post **45**, it is inclined at an acute angle with respect to the axis of the push rod **8** as shown by two dotted chain lines in FIG. **1** so that the circular edge portion of the through hole **41** comes to frictional engagement with the outer circumferential surface of the push rod **8**. Then, the driving piece **42** is forwarded along with the push rod **8** in the direction against the spring action of the coil spring **43**. Thus, a push rod driving means **4** for forwarding the push rod **8** is constituted. The push rod **8** is inserted in a freely slidable manner in a through hole **55** formed in the base portion **52** of the driving part **5**.

The push rod control means **6** comprises a control piece **62** and a coil spring **65**. The control piece **62** is made of a plate-like material in which a control opening **61** having a diameter slightly larger than the outer diameter of the push rod **8** is formed in the substantially central portion in the longitudinal direction of the control piece **62**. The push rod **8** is inserted in the control opening **61** and the upper end of the control piece **62** is inserted in an aperture **64** formed in a supporting plate **63** of a plate-like material which projects from the base portion **52** of the driving part **5** in substantially parallel to the axis of the push rod **8**. The coil spring **65** is provided between the lower part of the control piece **62** and the base portion **52** to push the lower part of the control piece **62** in the direction opposite the forwarding direction of the push rod **8**. The aperture **64** is formed to have both edges **66**, **67** which oppose with a predetermined span along the axial direction of the push rod **8**. When the push rod **8** is in stopped condition, the control piece **62** is urged to the edge **66** of the aperture **64** by the spring action of the coil spring **65**, the edge **66** being opposite to the forwarding direction of the push rod. In this case, the control piece **62** is inclined with respect to the axial direction of the push rod **8** so that the circular edge portion of the control opening **61** is in frictional engagement with the outer circumferential surface of the push rod **8**, with the result that the control piece **62** prevents movement of the push rod **8** in the direction opposite the forwarding direction.

When the push rod **8** is advanced in one direction of its axial direction, i.e. in the forwarding direction, the control piece **62** moves together with the push rod **8** while maintaining the frictional engagment with the push rod **8**. When the upper end of the control piece comes to contact with the other edge **67** of the aperture **64**, the coil spring **65** is further compressed according to the movement of the push rod **8** whereby an angle of inclination with respect to the push rod **8** is changed and the frictional engagement of the control opening **61** with the push rod **8** is weakened. Accordingly, the control piece **62** remains in the position to allow the movement of the push rod **8** in its axial direction. When the movement of the push rod **8** by means of the driving piece **42** is stopped, the angle of inclination of the control piece **62** becomes larges by the action of the coil spring **65**, and the control piece **62** is again brought into frictional engagement with the push rod **8**. Then, the push rod **8** is movable in the direction opposite the forwarding direction until the upper end of the control piece **62** comes into contact with the edge **66** of the aperture **64**.

When the extrusion device main body **1** is held by one hand and the lever **44** is turned toward the grip portion **53** by the other hand, the push rod **8** is forwarded in one direction along the axial direction by means of the driving piece **42**, whereby the slidable bottom **32** of the tubular container **3** is pushed by the pressing member **81** attached at the front end of the push rod **8** and the viscous material **33** is extruded from the nozzle **31**. In this case, the upper end of the control piece **62** is in contact with the edge **67** of the aperture **64** and the control piece **62** remains at a position compressing the coil spring **65**. When the lever **44** is released to stop the forwarding operation of the push rod **8**, the control piece **62** comes to frictional engagment with the push rod **8** at that position. At the same time, the force causing the driving piece **42** to incline at an acute angle with respect to the push rod **8** disappears, whereby the frictional engagement between the driving piece **42** and the push rod **8** also disappears, and the driving piece **42** and the lever **44** return to their original positions while the push rod **8** remains at the stop position. In this case, a force caused by expansion of air remaining in the tubular container **3** and compressed during the forwarding operation of the push rod **8** acts on the push rod **8**. Therefore, the push rod **8** is moved in the direction opposite the forwarding direction from a position that the upper end of the control piece **62** is in contact with the edge **67** of the aperture **64** into a position that the upper end comes to contact with the other edge **66**. By the movement of the push rod **8**, expansion of the air compressed in the tubular container **3** is absorbed to prevent unwanted discharge of the viscous material **33** from the nozzle **31**. Thus, the extrusion device being free from unwanted discharge of the viscous material can be attained by determination of the distance between the edges **66**, **67** of the aperture **64** to be sufficient to absorb expansion of air compressed, in consideration of the length of stroke of the driving piece **42**.

FIG. **4** shows a second embodiment of the present invention. In this embodiment, changes in two points are made. Firstly, the tubular container **3** is formed integrally with the extrusion device main body **1**.

Namely, the tubular container 3 is formed in such a manner that a head part 37 with a nozzle 36, which may be shaped by stamping a plate-like material into a bottomed tubular body, is screw-fitted to a cylindrical main body 38. An end portion of the main body 38 is connected by welding to a cylindrical fitting edge 59 which is adjacent to the driving part 5, and a piston 39 fitted to the inner surface of the cylindrical main body 38 is connected to the top end of the push rod 8. Secondly, the driving means 4 has been replaced by an electrically driving unit 7. Namely, the driving means is constructed in such a manner that a lever 71 made of an L-shaped plate-like material is journaled at its bent portion by the pin 54; a cylindrical post 73 similar to the cylindrical post 45 is attached to the end of one leg 72 of the lever 71; an elongated hole 75 is formed in the other leg 74; an electromagnetic solenoid 76 is provided in the grip portion 53 of the driving part 5; the end of an operating rod 77 of the electromagnetic solenoid 76 is engaged with the elongated hole 75 of the leg 74 in a slidable manner; and a normally opened switch 78 is attached to the grip portion 53. When the normally opened switch 78 is closed, the electromagnetic solenoid 76 is actuated by a power source (not shown) through a conductor 79 to retract the operating rod 77 to thereby cause turning movement of the lever 71. In FIG. 4, the same reference numerals as in FIGS. 1 to 3 designate the same parts, and therefore, description is omitted.

In the modified embodiment in which the tubular container 3 is formed integrally with the extrusion device main body 1, the extrusion device is used as follows. The nozzle 36 is inserted in a container for transportion or storage in which viscous material is filled, the control piece 62 of the push rod control means 6 is pushed to compress the coil spring 65 to thereby release frictional engagement with the push rod 8, and then the knob portion 84 formed at the rear end of the push rod 8 is pulled to retract the push rod to thereby introduce the viscous material 33 into the cylindrical main body 38. Alternatively, the head part 37 is removed from the cylindrical main body 38, viscous material 33 is filled in the main body 38 directly from the container, and thereafter the head part 37 is screw-fitted to the cylindrical main body 38.

The electrically driving unit 7 causes an angular movement of the lever 71 each time the normally opened switch 78 is pushed by the user's fingers. The driving piece 42 is pushed by the cylindrical post 73 to forward the push rod 8 for extrusion of the viscous material 33. The function and effect in this embodiment is the same as the embodiment in FIGS. 1 to 3, and therefore, description is omitted.

The change in design in two points as described above may be done for the embodiment in FIG. 4. However, either one change of design may be applied to the embodiment shown in FIGS. 1 to 3.

FIG. 5 shows a third embodiment of the present invention. The third embodiment is of a type in which the cartridge type tubular container 3 is received in the receiving part 2 of the main body 1 as in to the embodiment shown in FIG. 1. The construction of the driving part containing the driving means 4 is also identical with that of the embodiment in FIGS. 1 to 3. Accordingly, the same reference numerals as in FIGS. 1 to 3 designate the same parts and therefore, description is omitted.

In the third embodiment, the construction of a push rod control means 106 is different from that of the first embodiment. Namely, the push rod control means 106 is so constructed that a control piece 162 formed of a plate-like material has a control opening 161 having a diameter slightly greater than the outer diameter of the push rod 8 and formed at the substantially central portion in the longitudinal direction of the control piece 162. The push rod 8 is inserted in the control opening 161. A pulling rod 164 is slidably inserted in a through hole 163 formed at the upper part of the control piece 162 and a through hole 56 formed in the base portion 52 of the driving part 5 so as to be in substantially parallel to the axial direction of the push rod 8. An end of the pulling rod 164 extending in the base portion 52 has a threaded portion. A coil spring 165 is interposed between the inner surface of the base portion 52 and a stop piece 167 which is retained by a nut 166 fastened by screw engagement with the threaded portion of the pulling rod 164. An enlarged portion 168 is formed on the other end of the pulling rod 164 to exert the spring action of the coil spring 165 on the control piece 162. A supporting plate 169 of a plate-like material whose one end is connected to the base portion 52 by welding and which extends in substantially parallel to the push rod 8 is provided so that the other end of the supporting plate 169 is in contact with the control piece 162 at the intermediate position between the control opening 161 and the through hole 163. Accordingly, the upper part of the control piece 162 is pulled by the pulling rod 164 by the aid of the coil spring 165 around the fulcrum point at the top end of the supporting plate 169 to be inclined at an acute angle with respect to the axis of the push rod 8, whereby the circular edge portion of the control opening 161 is frictionally engaged with the outer circumferential surface of the push rod 8.

In the third embodiment, when the push rod 8 is pushed forwardly in its axial direction by the driving means 4, the control piece 162 is caused to turn around the fulcrum point at the top end of the supporting plate 169 due to friction between the control opening 161 and the push rod 8 to change the inclination angle. Change in the inclination angle of the control piece 162 weakens the frictional engagement with the push rod 8. Accordingly, the forwarding movement of the push rod 8 is allowed by the control piece 162 with the changed inclination angle. When the push rod 8 is stopped, strong frictional engagement between the control piece 162 and the push rod 8 is established by the spring action of the coil spring 165. At the moment, a force of expansion of air compressed in the tubular container 3 acts on the push rod 8 in the direction opposite the forwarding direction. Then, the control piece 162 moves together with the push rod 8 maintaining the frictional engagement with the push rod 8 in the direction opposite the forwarding direction of the push rod while compressing the coil spring 165. By the retracting movement of the push rod 8, expansion of air compressed in the container is absorbed, whereby unwanted discharge of the viscous material 33 from the nozzle 31 is prevented.

FIG. 6 shows a fourth embodiment of the present invention. The fourth embodiment is of a type similar to the first embodiment in which a cartridge type tubular container 3 is received in a receiving part 2 of an extrusion device main body 1 and a driving part 5 includes a driving means 4. Accordingly, the same reference numerals as in FIGS. 1 to 3 designate the same parts, and therefore, description is omitted.

In the fourth embodiment, the construction of a push rod control means **206** is different from those of the first and third embodiments. Namely, the push rod control means **206** is constructed in such a manner that a control piece **262** is formed of a plate-like material and has a control opening **261** having a diameter slightly larger than the outer diameter of the push rod **8** at the substantially central portion in the longitudinal direction of the control piece **262**. The push rod **8** is inserted in the control opening **261**. A pulling rod **264** is slidably inserted in a through hole **263** formed at the upper part of the control piece **262** and the through hole **56** formed in the base portion **52** of the driving part **5** so as to be in substantially parallel to the axis of the push rod **8**. A first coil spring **265** is interposed between a stop piece **267** adjacent to a nut **266** which is screw-fitted to an end of the pulling rod **264** and the inner surface of the base portion **52**. The first coil spring **265** is wound around the pulling rod **264** so that the spring action of the first coil spring **265** is exerted on the control piece **262** by means of an enlarged portion **268** formed at the other end of the pulling rod **264**. A second coil spring **269** is interposed between the control piece **262** and the base portion **52** and is wound around the push rod **8** so as to push the control piece **262** in the direction opposite the forwarding direction of the push rod **8**, whereby the control piece **262** is caused to be inclined at an acute angle with respect to the axis of the push rod **8** and the circular edge portion of the control opening **261** is frictionally engaged with the outer circumferential surface of the push rod **8**.

In the fourth embodiment, when the push rod **8** is forwarded by the driving means **4**, the control piece **262** keeping the frictional engagement with the push rod **8** moves, the one hand, to compress the second coil spring **269** and on the other hand to release the compression of the first coil spring **265**. Accordingly, when the second coil spring **269** is slightly compressed and the first coil spring **265** slightly elongated, the inclination angle of the control piece **262** to the push rod **8** is changed to weaken the frictional engagement with the push rod **8**, and the push rod **8** is further forwarded while the control piece **262** is left at a position where the inclination angle is changed. When the movement of the push rod **8** is stopped, frictional engagement is again established between the control piece **262** and the push rod **8** by the spring action of the second coil spring **269**. In this case, expansion of air compressed in the tubular container **3** acts on the push rod **8** in the direction opposite the forwarding direction. Accordingly, the control piece **262** moves compressing the first coil spring **265** in the direction opposite the forwarding direction of the push rod **8** while keeping the frictional engagement with the push rod **8**, thereby absorbing a force of expansion of the compressed air, with the result of prevention of the unwanted discharge of viscous material **33** from the nozzle **31**.

In the fourth embodiment, the second coil spring **269** serves as a fulcrum point for the control piece **262**. For the purpose of this, the spring action of the second coil spring **269** is made sufficiently greater than that of the first coil spring **265**.

It is possible that change of design concerning two points described with reference to FIG. **4** is made simultaneously or separately to the third and fourth embodiments.

Thus, according to the first to the fourth embodiments of the present invention, when viscous material filled in the tubular container is extruded from the nozzle formed at the front end of the tubular container by forwarding the push rod in one direction along the axial direction, the control piece of the push rod control means moves with the push rod for a predetermined distance because the circular edge portion of the control opening of the control piece is frictionally engaged with the outer circumferential surface of the push rod. When the push rod is further advanced over the predetermined distance, the inclination angle of the control piece with respect to the axis of the push rod is changed to weaken the frictional engagement with the push rod, whereby the forwarding movement of the push rod is not hindered. When the push rod is stopped to go forward, i.e. extruding operation for the viscous material is stopped, the push rod control means causes the control piece to be inclined at an acute angle again with respect to the axis of the push rod by the spring action of the coil spring to establish the frictional engagement with the push rod at a position where the push rod is stopped. In this case, when a force of expansion of air compressed in the tubular container acts on the push rod in the direction opposite the forwarding direction of the push rod, the push rod moves in the opposite direction together with the control piece for a predetermined distance to absorb the expansion of the air. When the forwarding movement of the push rod is started again, the viscous material can be extruded.

As described above, since expansion of air in the tubular container is absorbed by the retracting movement of the push rod, unwanted discharge of the viscous material in the tubular container can be prevented. Further, waste of the viscous material and unexpected contamination of an operator's body and place for working are avoided.

In the foregoing embodiments, it is possible to use a driving means in which the push rod is forwarded in one direction along its axial direction when the driving means is actuated and the push rod is allowed to move in the direction opposite the former direction when the driving means is in non-operation.

FIGS. **7** to **9** show a fifth embodiment of the present invention. In the figures, the same reference numerals as in FIGS. **1** to **6** designate the same parts, and therefore, description of these parts is omitted.

Inside the base portion **52** of the driving part **5**, there is provided a driving piece **342** formed of a rectangular thick plate-like material in which a control opening **341** having a diameter slightly greater than the outer diameter of the push rod **8** is formed. The driving piece **342** is slidable in the axial direction of the push rod with some clearance by inserting the push rod **8** in the control opening **341**.

A push rod control means **306** has a control piece **362** formed of a plate-like material in which a control opening **361** having a diameter slightly larger than the outer diameter of the push rod **8** at the substantially central portion in the longitudinal direction of the control piece **362**. The push rod **8** is inserted in the control opening **361**. The control piece **362** is turnably supported at a portion above the control opening **361** by inserting that portion in an aperture **364** which is formed in a supporting plate **363** projecting from the base portion **52** of the driving part **5** extending in substantially parallel to the axial direction of the push rod. A second coil spring **365** is wound around the push rod **8** and between the control piece **362** and the base portion **52**, whereby the control piece **362** is pushed in the second direction

along the axis of the push rod, which is opposite the forwarding direction of the push rod.

The driving piece **342** has at the upper end a releasing piece **391** extending at the right angle in the second direction of the axial direction of the push rod **8** so that the releasing piece **391** projects outwardly from the base portion **52**. A recess **359** is formed at the upper part of the base portion **52** of the driving part **5**. The length of the releasing piece **391** is so determined that when the driving piece **342** is brought to a critical position in the second direction along the axial direction of the push rod **8**, namely, the original position of the driving piece **342**, it comes in contact with the upper part of the control piece **362** to push it, with the result that the control piece **362** is turned around the fulcrum point at the aperture **364** of the supporting plate **363** in the direction compressing the second coil spring **365**, whereby the inclination angle of the control piece **362** to the push rod **8** is changed thereby to release frictional engagement between the circular edge portion of the control opening **361** and the outer circumferential surface of the push rod **8**.

According to the fifth embodiment, when the extrusion device main body **1** is held by gripping the grip portion **53** and the lever **44**, and the lever **44** is repeatedly operated around the pin **54**, the push rod **8** is intermittently forwarded in the first direction along the axis of the push rod to extrude the viscous material **33** from the nozzle **31** of the tubular container **3**. While the lever **44** is operated, the push rod is stopped each time of the operation by means of the control piece **362**. However, when an operator stops to extrude the viscous material by making the lever **44** free, the driving piece **342** is returned to the critical position in the second direction (i.e., to its original position) by the spring action of the coil spring **43**. At the moment, the releasing piece **391** projecting from the upper end of the driving piece **342** comes in contact with the upper part of the control piece **362** to change the inclination angle of the control piece **362**. The change of the angle for the control piece **362** releases the frictional engagement between the control piece **362** and the push rod **8**. When the forwarding movement of the push rod **8** in the first direction is stopped, there is tendency of expansion of air compressed in the tubular container **3** due to pressure applied by the push rod **8**. A force of expansion of air functions on the one hand to extrude the viscous material **33** from the nozzle **31** and on the other hand to return the push rod **8** in the second direction. In this case, however, since the frictional engagement between the control piece of the push rod control means **6** and the push rod **8** is released by the releasing piece **391**, the push rod **8** is returned in the second direction due to expansion of air thereby absorbing the force of expansion of air to prevent unwanted discharge of the viscous material **33** from the nozzle **31**.

FIG. **10** shows a sixth embodiment of the extrusion device in which the relating means as shown in FIGS. **7** to **9** is applied to the embodiment shown in FIG. **4**.

FIG. **11** shows a seventh embodiment of the present invention in which a cartridge type tubular container **3** is received in the receiving part **2** of the extrusion device main body **1** which is similar to the embodiment in FIG. **7**. The construction of the driving part **5** containing the driving means **4** is also identical with that in FIGS. **7** to **9**. Accordingly, the same reference numerals as in FIGS. **7** to **9** designate the same parts, and therefore, description of these parts is omitted.

In the seventh embodiment, a push rod control means **406** comprises a control piece **462**, a supporting plate **463** having an aperture **464**, and a second spring **465**. The control piece **462** has an extension **466** at the lower part which is integrally formed with the control piece **462**. The lower part of the extension **466** extends inside the grip portion **53** through a through hole **458** formed in the base portion **52** of the driving part **5** or the grip portion **53**. A hole **492** is formed in the lower part of the extension **466**, and a hole **493** is formed in the lever **44** opposing the hole **492**. A wire **494** having head portions **495** at both ends extends between the holes **492**, **493** with the head portions **495** engaging with the holes. The length of the wire **494** is determined such that when the driving piece **42** is returned to a critical position in the second direction along the axial direction of the push rod **8** (namely, its original position) by the spring action of the coil spring member **43**, and the lever **44** is also returned to the original position by the driving piece **42**, the control piece **462** is turned around the fulcrum point at the aperture **464** of the supporting plate **463** against the spring action of the second spring **465** to change the inclination angle of the control piece **462** with respect to the push rod **8**, whereby the frictional engagement between the control piece **462** and the push rod **8** is released.

In the seventh embodiment, the function of extruding the viscous material **33** by the operation of the lever **44** is the same as that in the fourth embodiment. However, when a force exerted by the operator's hand is applied to the lever **44**, tension of the wire **494** is released, whereby the function of the control piece **62** for preventing the movement of the push rod **8** in the second direction can not be hindered. When the lever **44** becomes free from the operator and extruding operation of the viscous material **33** is stopped, namely, the driving piece **42** is returned to the original position and the lever **44** is also returned to the original position, the wire **494** extends tightly so as to pull the extension **466**. Then, the inclination angle of the control piece **462** is changed and the frictional engagement between the control piece **462** and the push rod **8** is released to render the movement of the push rod **8** in the second direction to be free. Accordingly, a force of expansion of air compressed in the tubular container **3** is absorbed as in the fourth embodiment, whereby unwanted discharge of the viscous material **33** from the nozzle **31** is prevented.

The change of design in two points described with reference to the embodiment as shown in FIG. **4** can also be possible for the seventh embodiment.

Thus, in the seventh embodiment, when the lever **44** is operated to move the driving piece **42** in the first direction, the push rod **8** is forwarded in the first direction by the frictional engagement between the driving piece **42** and the push rod **8**. On the other hand, when the driving piece **42** is moved in the second direction, the push rod **8** is retained at a position that the push rod **8** has been moved in the first direction. By the intermittent movement of the push rod **8**, a desired amount of the viscous material **33** can be extruded from the tubular container **3** to apply to a desired point.

In addition to the above-mentioned construction, the seventh embodiment of the present invention comprises a releasing means for disengaging the push rod from the control piece when the driving piece is brought to a critical position in the second direction for the push rod. For instance, the releasing means is provided with a

releasing piece extending from the driving piece to be in contact with the control piece or a releasing wire connecting the extension of the control piece to the lever. Accordingly, when the driving piece comes to a critical position in the second direction without any operational force applied to the lever due to interruption of extrusion, the frictional engagement between the push rod and the control piece is released, and a force of expansion of air compressed in the tubular container can be absorbed without prevention of the movement of the push rod in the second direction. Thus, a cause of unwanted discharge of the viscous material can be eliminated.

What is claimed is:

1. An extrusion device for extruding viscous material, said extrusion device comprising:

(a) a main body adapted to receive a tubular container containing viscous material and having a nozzle at the distal end and a slidable bottom at the proximal end;

(b) a push rod supported by said main body so as to be slidable in the axial direction of said main body, whereby, in use, viscous material in a tubular container received in said main body is extruded from the nozzle at the distal end of the tubular container when the slidable bottom at the proximal end of the tubular container is pushed toward the distal end of said main body by said push rod; and

(c) a push rod control means comprising:

(i) a supporting plate projecting from said main body at least generally parallel to the axial direction of said push rod, said supporting plate having an aperture therethrough;

(ii) a control piece having a first end, a second end, and a control opening therethrough intermediate its first and second ends, said control opening receiving said push rod, the first end of said control piece being received in said aperture in said supporting plate and being both axially movable relative to said push rod and said main body and pivotably movable relative to said push rod and said main body; and

(iii) a first spring member interposed between said main body and the second end of said control piece, said first spring member urging said control piece to pivot into an inclined position relative to the axis of said push rod, in which inclined position opposed portions of the periphery of said control opening frictionally engage said push rod, which frictional engagement is maintained when said push rod and said control piece are moved axially relative to said main body until contact of said control piece with the periphery of said aperture causes said control piece to pivot relative to said push rod so as to release the frictional engagement between said push rod and the opposed portions of the periphery of said control opening.

2. An extrusion device as recited in claim 1 wherein:

(a) said push rod is circular in cross-section and

(b) said control opening is circular in shape.

3. An extrusion device as recited in claim 1 wherein said first spring member is a coil spring.

4. An extrusion device for extruding viscous material, said extrusion device comprising:

(a) a main body adapted to receive a tubular container containing viscous material and having a nozzle at the distal end and a slidable bottom at the proximal end;

(b) a push rod supported by said main body so as to be slidable in the axial direction of said main body, whereby, in use , viscous material in a tubular container received in said main body is extruded from the nozzle at the distal end of the tubular container when the slidable bottom at the proximal end of the tubular container is pushed toward the distal end of said main body by said push rod; and

(c) a push rod control means comprising:

(i) a supporting plate projecting from said main body at least generally parallel to the axial direction of said push rod;

(ii) a control piece having a first end, a second end, and a control opening therethrough formed in the first end of said control piece and receiving said push rod, said control piece being both axially movable relative to said push rod and said main body and pivotally movable relative to said push rod and said main body, said supporting plate contacting said control piece intermediate the first and second ends of said control piece; and

(iii) a first spring member acting on the second end of said control piece and urging said control piece to pivot into an inclined position relative to the axis of said push rod, in which inclined position opposed portions of the periphery of said control opening frictionally engage said push rod, which frictional engagement is maintained when said push rod and said control piece are moved axially relative to said main body until contact of said control piece with said supporting plate causes said control piece to pivot relative to said push rod so as to release the frictional engagement between said push rod and the opposed portions of the periphery of said control opening.

5. An extrusion device as recited in claim 4 wherein:

(a) said push rod is circular in cross-section and

(b) said control opening is circular in shape.

6. An extrusion device as recited in claim 4 wherein :

(a) a first throughhole is formed in the second end of said control piece;

(b) a pulling rod is received in said first throughhole; and

(c) said first spring member acts on said pulling rod.

7. An extrusion device as recited in claim 6 wherein:

(a) said pulling rod passes through a second throughhole in said main body;

(b) a spring seat is mounted on said pulling rod; and

(c) said first spring member bears at one end against said spring seat and at the other end against said main body.

8. An extrusion device for extruding viscous material, said extrusion device comprising:

(a) a main body adapted to receive a tubular container containing viscous material and having a nozzle at the distal end and a slidable bottom at the proximal end;

(b) a push rod supported by said main body so as to be slidable in the axial direction of said main body, whereby, in use, viscous material in a tubular container received in said main body is extruded from the nozzle at the distal end of the tubular container when the slidable bottom at the proximal end of the

tubular container is pushed toward the distal end of said main body by said push rod;

(c) a driving piece having a first control opening therethrough receiving said push rod, said driving piece being both axially movable relative to said push rod and said main body and pivotally movable relative to said push rod and said main body;

(d) a driving means comprising:

(i) a second spring member urging said driving piece toward the proximal end of said main body and

(ii) first means for moving said driving piece toward the distal end of said main body against the urging of said second spring member; and

(e) a push rod control means comprising:

(i) a supporting plate projecting from said main body at least generally parallel to the axial direction of said push rod, said supporting plate having an aperture therethrough;

(ii) a control piece having a second control opening therethrough receiving said push rod, said control piece being received in said aperture in said supporting plate and being both axially movable relative to said push rod and said main body and pivotally movable relative to said push rod and said main body;

(iii) a releasing piece projecting from said driving piece toward said control piece; and

(iv) a first spring member urging said control piece to pivot into an inclined position relative to the axis of said push rod, in which inclined position opposed portions of the periphery of said second control opening frictionally engage said push rod, which frictional engagement is maintained when said push rod and said control piece are moved axially relative to said main body until contact of said control piece with said releasing piece causes said control piece to pivot relative to said push rod so as to release the frictional engagement between said push rod and the opposed portions of the periphery of said second control opening.

9. An extrusion device as recited in claim **8** wherein:

(a) said push rod is circular in cross-section and

(b) said control opening is circular in shape.

10. An extrusion device as recited in claim **8** wherein said first means comprise a lever manually pivotable about a fulcrum on said main body.

11. An extrusion device as recited in claim **8** wherein said first means comprise a lever pivotable about a fulcrum on said main body by electromagnetic means.

12. An extrusion device as recited in claim **8** wherein said first spring member is a coil spring which bears at one end against said main body and at the other end against said control piece.

13. An extrusion device as recited in claim **12** wherein said coil spring surrounds said push rod.

14. An extrusion device for extruding viscous material, said extrusion device comprising:

(a) a main body adapted to receive a tubular container containing viscous material and having a nozzle at the distal end and a slidable bottom at the proximal end;

(b) a push rod supported by said main body so as to be slidable in the axial direction of said main body, whereby, in use, viscous material in a tubular container received in said main body is extruded from the nozzle at the distal end of the tubular container when the slidable bottom at the proximal end of the tubular container is pushed toward the distal end of said main body by said push rod; and

(c) a driving piece having a first control opening therethrough receiving said push rod, said driving piece being both axially movable relative to said push rod and said main body and pivotally movable relative to said push rod and said main body;

(d) driving means comprising:

(i) a second spring member urging said driving piece toward the proximal end of said main body and

(ii) a lever having a first end and a second end, said lever being pivotable at a point intermediate its first and second ends about a fulcrum on said main body, said lever bearing against said driving piece such that pivotable movement of said lever about said fulcrum in a first direction causes said driving piece to move toward the distal end of said main body against the urging of said second spring member; and

(e) a push rod control means comprising:

(i) a supporting plate projecting from said main body at least generally parallel to the axial direction of said push rod, said supporting plate having an aperture therethrough;

(ii) a control piece having a second control opening therethrough receiving said push rod, said control piece being received in said aperture in said supporting plate and being both axially movable relative to said push rod and said main body and pivotally movable relative to said push rod and said main body;

(iii) a wire connecting said control piece to said lever; and

(iv) a first spring member urging said control piece to pivot into an inclined position relative to the axis of said push rod, in which inclined position opposed portions of the periphery of said control opening frictionally engage said push rod, which frictional engagement is maintained when said push rod and said control piece are moved axially relative to said main body until said wire becomes taut, causing said control piece to pivot relative to said push rod so as to release the frictional engagement between said push rod and the opposed portions of the periphery of said control opening.

15. An extrusion device as recited in claim **14** wherein:

(a) said push rod is circular in cross-section and

(b) said control opening is circular in shape.

16. An extrusion device as recited in claim **14** wherein said first spring member is a coil spring which bears at one end against said main body and at the other end against said control piece.

17. An extrusion device as recited in claim **16** wherein said coil spring surrounds said push rod.

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